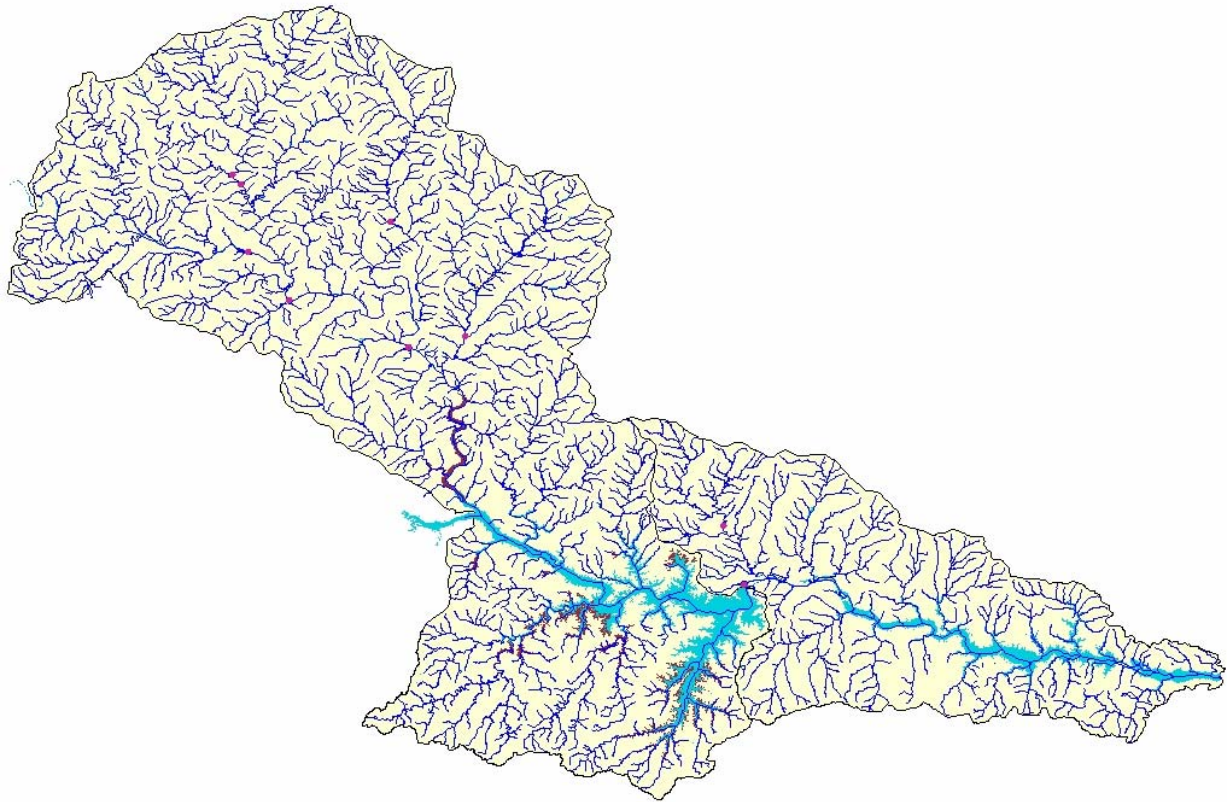


NHDGEOinSHP

Reach Indexing Tool

User's Guide



NHDGEOSHP Reach Indexing Tool, NHDGEOSHP Load/Unload
Workspace, NHDGEOSHP Projection Utility, NHDGEOSHP Navigate

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Introducing the NHDGEOinSHP Toolkit

The NHDGEOinSHP Toolkit is a collection of ArcView (version 3.2 or higher) extensions that are designed to assist users in the understanding and use of the National Hydrography Dataset (NHD). The NHDGEOinSHP Toolkit currently contains the following extensions:

- **Load/Unload NHDGEOSHP Workspace (Load/Unload)**—This extension allows you to load, unload, and symbolize NHDGEOinSHP workspaces. The extension allows you to select a standard set of features to load or make a custom selection.
- **NHDGEOSHP Navigate (Navigate)**—This extension will perform navigations on all NHDGEOinSHP workspaces loaded into the current View and display the navigation results. You can specify the beginning and endpoints of the navigation, as well as the direction (upstream or downstream).
- **NHDGEOSHP Reach Indexing Tool (RIT)**—The RIT is a tool for associating surface water entities, like trout waters or high quality waters, with NHD. The RIT uses ESRI's dynamic segmentation model to build event tables that store information about the NHD reaches. The RIT allows you to map surface water attributes without editing the underlying NHDGEOinSHP workspace.
- **NHDGEOSHP Projection Utility (Projection Utility)**—This extension can be used to project NHDGEOinSHP workspaces.
- **NHDGEOSHP Edit (Edit)**—This extension allows users to submit NHDGEOinSHP updates to the USGS. This extension is not included in this user's guide since it is not used in conjunction with the RIT.

When you install the NHDGEOinSHP Toolkit on your computer, you get all five extensions. You can download the NHDGEOinSHP Toolkit on the Internet at <http://nhd.usgs.gov/tools.html>.

What is the National Hydrography Dataset (NHD)?

NHD is a nationally consistent hydrography dataset for the United States. It is the culmination of cooperative efforts between the U.S. Environmental Protection Agency (EPA) and the U.S. Geological Survey (USGS). It combines elements of the USGS digital line graph (DLG) hydrography files and the EPA Reach File (RF3). NHD is designed to serve three simultaneous functions for surface waters:

- Provide a standard unique identifier (reach code) for each part of the surface water network, for isolated streams, and for certain types of waterbodies,
- Contain a tabular routing (navigation) network of these features, and
- Include a digital map representation of these features.

Introducing the NHDGEOinSHP Toolkit

The significance of the reach codes is that they provide a common nomenclature for georeferencing surface water entities. The benefit of using a reach file like NHD for surface water indexing is that the surface water data become anchored to reaches with unique identifiers. This provides nationally consistent location information, as well as data compatibility between agencies and programs. Other benefits of using NHD are that the maintenance of a national coverage allows users to benefit from the enhancements of other users, and that the use of NHD ensures institutional memory for work performed using the national standard. Using a national standard also ensures a readily accessible replacement for coverages that are inadvertently damaged during processing. More information about NHD is available on the Internet at <http://nhd.usgs.gov>.

What is NHDGEOinSHP?

NHDGEOinSHP is the next generation of the National Hydrography Dataset. NHDGEOinSHP is stored in an enterprise geodatabase at USGS. You can access the geodatabase on line (<http://nhd.usgs.gov>) and request data for the subbasins you are interested in. When you make a request, in addition to designating a resolution, you must also select whether you would like to receive the data in personal geodatabase format, in Arc/Info Coverage format or in Shapefile format. In order to use the NHDGEOinSHP data with this ArcView 3.x toolkit, you must select the Shapefile format. This format is referred to as NHDGEOinSHP.

There are several differences between the new NHDGEOinSHP format and the legacy NHDinARC format. Two differences important to NHDGEOinSHP Toolkit users are:

- New data access - NHD is now available via an ArcIMS interface on the USGS website.
- The artificial paths in NHDGEOinSHP are individual flowlines, rather than one large reach. This will make artificial paths easier to select and work with.

The NHDGEOinSHP data format is not compatible with the NHD ArcView Toolkit. If you need NHDin ARC data to use with the NHD ArcView Toolkit, contact the EPA's Office of Water Support e-mail helpdesk at owsupport@rti.org.

What's new in the NHDGEOinSHP Toolkit?

The NHDGEOinSHP Toolkit functions similarly to the previous NHDinARC Toolkit. The most notable difference is that the NHDGEOinSHP Toolkit operates on the NHDFlowlines feature layer instead of the NHD Linear Reach feature layer. This means that in order to create linear event tables, you must have the NHDFlowlines Layer loaded into your View. The use of Flowlines as the base unit, instead of the transport reaches, will facilitate use of high resolution data with the NHDGEOinSHP toolkit. In NHDGEOinSHP, reach code is included in the NHDFlowlines Feature layer, so no functionality has been lost from the Toolkit as a result of this change.

Getting Started with the NHDGEOinSHP Toolkit

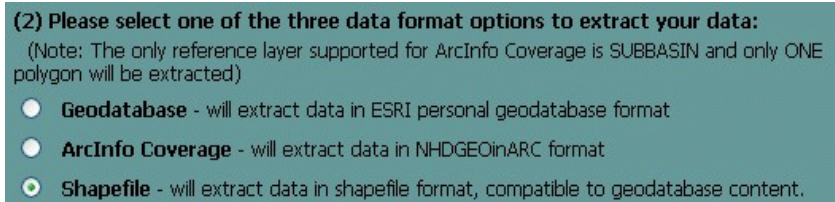
Requirements

The NHDGEOinSHP Toolkit requires the following hardware at a minimum:

- A 200 MHz Pentium (or equivalent) personal computer with 64MB of RAM, running Windows 95/98/NT/2000/XP;
- A 15-inch or larger color graphics monitor;
- Substantial available hard disk space; 100 MB is recommended;
- ArcView version 3.2 or higher.

Obtaining and Working with NHDGEOinSHP

In order to use the NHDGEOinSHP ArcView Toolkit, you also need NHDGEOinSHP workspaces. You can download NHDGEOinSHP workspaces from <http://nhd.usgs.gov>. These workspaces are distributed by USGS subbasins. The NHDGEOinSHP Toolkit is only compatible with NHDGEOinSHP workspaces, so when you obtain workspaces from the NHD website, make sure you specify that you would like to receive them in a *shapefile* format, as shown below.



Pick the *Shapefile* data format when obtaining NHD workspaces for use with the NHDGEOinSHP ArcView Toolkit.

NHDGEOinSHP is distributed as compressed workspaces that have been zipped (*.zip). Each workspace contains data for one 8-digit USGS subbasin. These workspaces must be decompressed using WinZip or comparable decompression software. Decompression utilities are part of the NHDGEOinSHP Toolkit installation. The RIT includes a utility (Uncompress NHD Workspace) that will run these utilities for you from ArcView. You can also use Uncompress NHDGEOSHP Workspace to decompress multiple workspaces in a single step.

Appending NHDGEOinSHP Coverages

NHDGEOinSHP Load/Unload Workspace

If you wish to work with NHDGEOinSHP workspaces that cover more than one USGS subbasin, you can append them using the Append NHD Arc Macro Language (AML). This tool will be available soon.

Working with Projected Coverages

NHDGEOinSHP coverages are distributed as unprojected (geographic - decimal degree) data. If you wish to work using a different data projection, it is recommended that you use the NHDGEOSHP Projection Utility extension to project your NHDGEOinSHP workspace. Using this utility ensures an accurate translation of your reach indexing data, should you choose to reproject it.

The NHDGEOinSHP ArcView Toolkit is compatible with projected workspaces in which the distance units are degrees, meters, or feet. A few other requirements for projected data are enforced when you attempt to load an NHDGEOinSHP workspace:

- Data in NHDGEOinSHP format have a projection file (NHDFlowline.prj) that contains a datum, the datum value must be "D_North_American_1983" or "D_GRS_1980".
- If there is no projection file (NHDFlowline.prj), then you are prompted with the standard ArcView projection dialog and should respond with either GRS80 or Clark1866 as the Spheroid. The Toolkit will not support any other options.

Installing the NHDGEOinSHP Toolkit

Double click on the "**NHDGEOSHPToolkit2_0_0b1.exe**" (or higher version) file that you downloaded from the NHD website (<http://nhd.usgs.gov>). The installation program will guide you through the installation process. You should run the installation on the machine where ArcView is installed; if you run ArcView over a network, you should run the installation on the server computer. During the installation, you will have the option of installing 7-zip, which is required to be able to use the Uncompress NHDGEOSHP Workspace function of the toolkit. When you have finished the installation, Load/Unload Workspace and Reach Indexing Tool will be available as extensions under the ArcView **File** menu.

The installation will create a folder on your computer called **NHDGEOSHPToolkit**. This folder contains files needed by the extensions as well as the online help files. Do not delete this folder as that will cause the Toolkit extensions to malfunction. The RIT will also create a **RIT** folder in your temp directory after your first use of the RIT. Your user and source information for use in the metadata is stored in this folder. If you delete this folder, you will have to re-enter this information.

NHDGEOinSHP Load/Unload Workspace

The Load/Unload Workspace extension allows you to load and symbolize the different features contained in an NHDGEOinSHP workspace. The extension will also initialize links between the tables and feature data in the loaded NHDGEOinSHP workspaces.

Loading an NHDGEOinSHP Workspace

- Step 1.** To use Load/Unload, choose *Extensions...* from the **File** menu in your ArcView project, check the checkbox for **NHDGEOSHP Load/Unload Workspace** and click **OK**. This will add the **NHD_Tools** menu to your View.
- Step 2.** Select **Load NHDGEOSHP Workspace** from the **NHD_Tools** menu. You will be prompted to select the “openme.txt” file in your NHDGEOinSHP workspace directory (Figure 1).

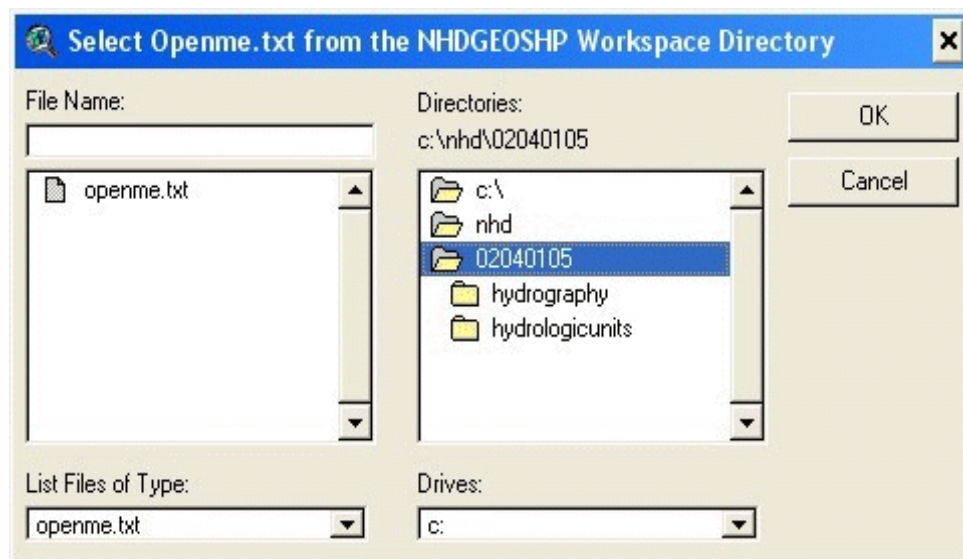


Figure 1. Select the “openme.txt” file.

Navigate to this openme.txt file and click **OK**. (Note: You must have decompressed NHDGEOinSHP workspaces before you can use Load/Unload NHDGEOSHP Workspace).

- Step 3.** You will be prompted to select your desired load options. This allows you to select specific NHD features and links that you would like to load into your project. For reach indexing, you can load the necessary NHD features by clicking the checkbox for “Reach Indexing Themes, Tables and Links”. If you are unsure what to choose, choose **All Themes, Tables, and Links** (Figure 2).

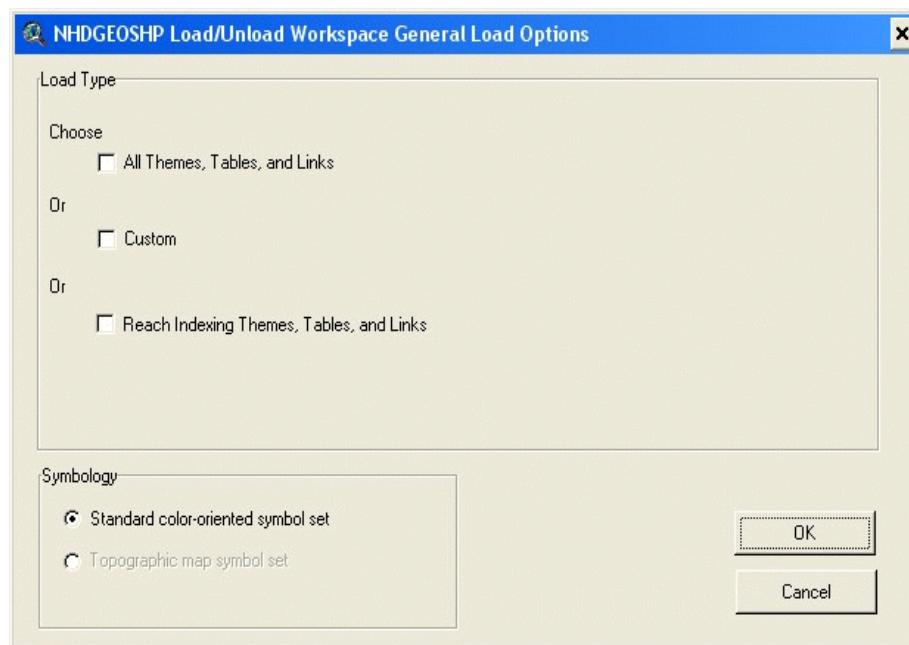


Figure 2. Load/Unload Workspace general load options

Step 4. Click **OK**. This will load the NHD themes into your View (Figure 3).

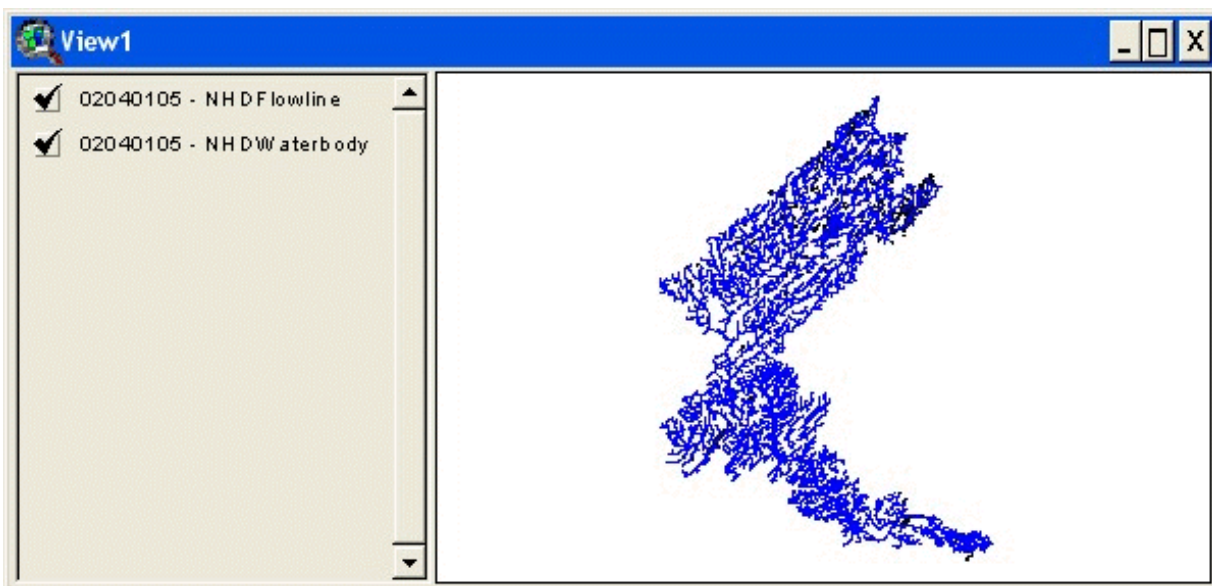


Figure 4. NHDGEOinSHP themes in the View

NHDGEOinSHP Load/Unload Workspace

If you would like more information about the NHD themes in your View, please refer to the reference documents available on the Internet at <http://nhd.usgs.gov/techref.html>.

Other Features

Unload NHDGEOinSHP Workspace(s)

This feature allows you to remove any NHDGEOinSHP workspaces you have loaded in your ArcView project. Click on ***Unload NHDGEOSHP Workspace(s)*** from the ***NHD_Tools*** menu to remove all themes, tables, and links that you have loaded. If you have more than one NHDGEOinSHP workspace loaded, you will be able to select one or more workspaces to unload.

*Note: If you use ArcView's **Delete Themes** option from the **View** menu to remove NHD themes, it will cause Load NHDGEOSHP Workspace to malfunction.*

Show NHDGEOinSHP Tables

This feature allows you to view the NHDGEOinSHP tables that you have loaded into your Project. When you choose ***Show NHDGEOSHP Tables*** from the ***NHD_Tools*** menu, the NHDFlowline, Incoming Flow (NHDFlow), Outgoing Flow (NHDFlow), NHDWaterbody and Feature Code (NHDfcode) tables are opened. To learn more about which table links may be available, see the “Show NHDGEOSHP Tables” help topic in the ***NHDGEOSHP Load/Unload Workspace Help*** available from your ArcView ***Help*** menu.

Hide NHDGEOinSHP Tables

This feature will hide the tables in your ArcView window that you displayed using ***Show NHDGEOSHP Tables***.

Change View Name

This feature allows you to change the name of your active View. When you are using Load/Unload NHDGEOSHP Workspace, this is the only method you should use to change your View name. If you change your View name using the ***Properties*** option from the ***View*** menu, it may cause Load/Unload NHDGEOSHP Workspace to malfunction.

Refresh Loaded Workspace(s)

Load/Unload NHDGEOSHP Workspace creates files in your temp directory that store information about the linkages ArcView puts in place when you load a workspace. If these temp files are deleted, ArcView will prompt you for their location when you open a saved ArcView project in which you used Load/Unload NHDGEOSHP Workspace. Refresh Loaded Workspace(s) will recreate these files for you so that you may continue to use your project. Select *Refresh Loaded Workspace(s)* from the *NHD_Tools* menu. This feature is also useful for restoring a workspace in your View when a theme, table, or link is inadvertently renamed or deleted from the project.

Display Measure



Display Measure is a button on the toolbar in your ArcView View. By activating this tool and clicking on an NHD Flowline, a pink point, a ReachCode and a Measure will be added as graphics to the view (Figure 4). To remove the graphics from the view, use the ArcView pointer tool to select the graphics and then delete them with the keyboard delete key.

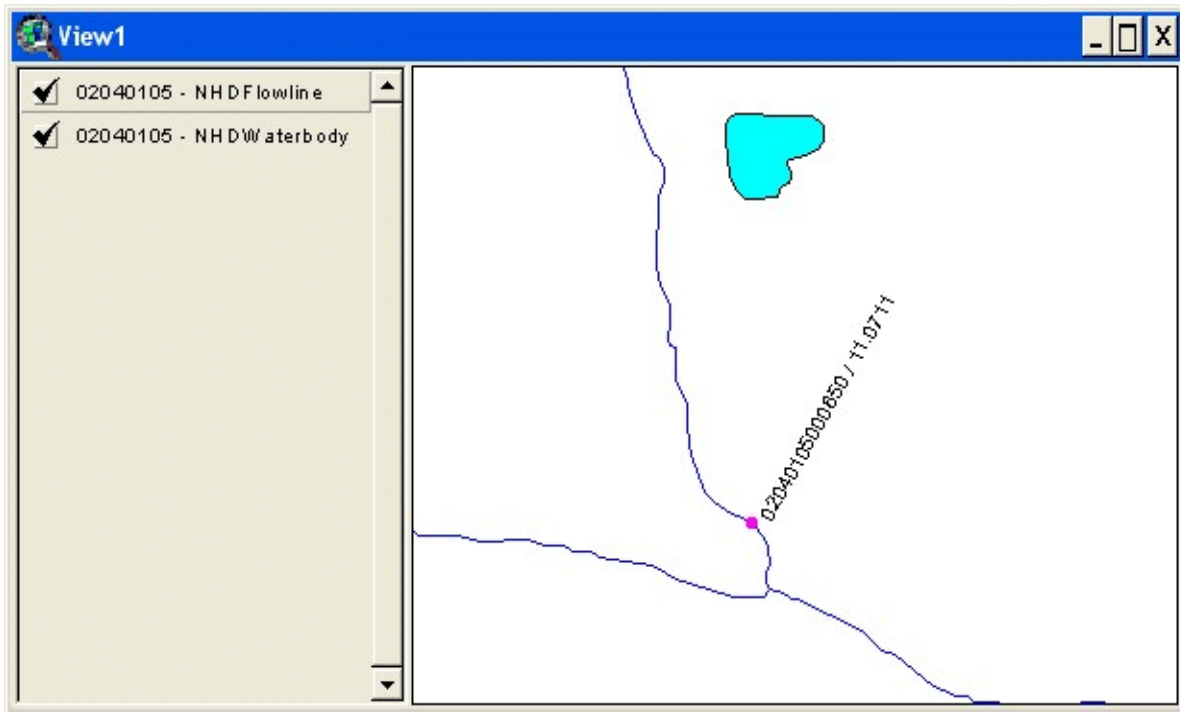


Figure 4. Measure displayed in view.

NHDGEOinSHP Projection Utility

If you choose to work with projected data, you can use the Projection Utility to project NHDGEOinSHP workspaces to a projection of your choice.

Using the NHDGEOinSHP Projection Utility

- Step 1.** Open a new ArcView project and set the View to your desired projection by clicking on the **View->Properties** menu and clicking the **Projection** button. When your projection is set, click **OK**.
- Step 2.** To use the Projection Utility, choose **Extensions...** from the **File** menu in your ArcView project, check the checkbox for **NHDGEOSHP Projection Utility** and click **OK**. If you do not already have the **NHD_Tools** menu in your project, it will be added.
- Step 3.** Select **Project NHDGEOSHP Workspace** from the **NHD_Tools** menu. You will be prompted to select the “openme.txt” file in your NHD workspace directory (Figure 5). Navigate to this file in the folder for the workspace you would like to convert and click **OK**.

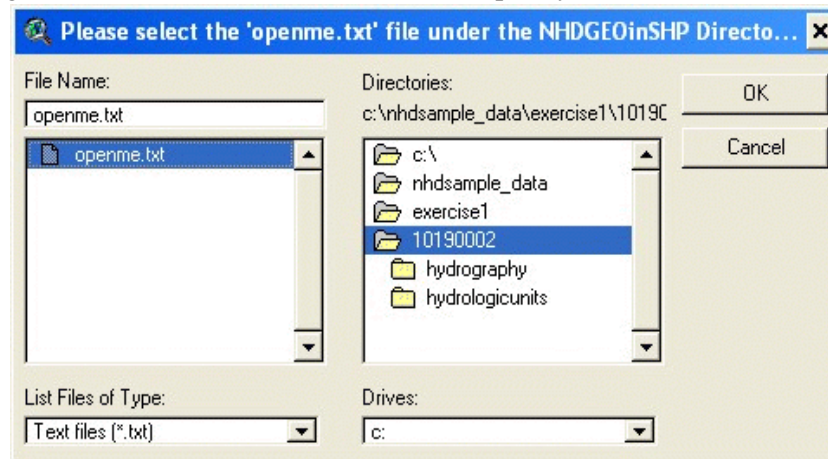


Figure 5. Select the “openme.txt” file.

- Step 4.** You will be prompted to select a projection for your converted workspace. You can choose the Current View Projection or the National Albers Projection. Make your choice and click **OK**.
- Step 5.** You will be prompted to select a name and storage location for your projected workspace. The default name is the original workspace name plus “prj”, and the default location is the directory where your NHDGEOinSHP workspace is stored. Choose a name and storage location, or accept the defaults and click **OK**.

Step 6. You will get a message box when the conversion has been completed successfully (Figure 6).

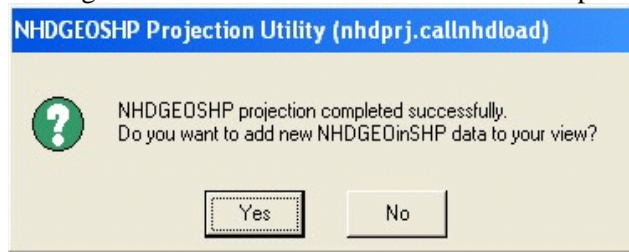


Figure 6. Projection utility message box

Your projected workspace will have a directory structure similar to the NHDGEOinSHP workspace. To load the projected NHDGEOinSHP workspace in to your project, use Load/Unload Workspace and navigate to the "openme.txt" file just like you would for an NHDGEOinSHP workspace.

Running Projection Utility in Batch Mode

You can use Projection Utility to project batches of NHDGEOinSHP workspaces. The Projection Utility contains a sample script that you can modify to facilitate this process. Before you can run a batch processing script, you need to create a text file that contains the file names and path names of the NHDGEOinSHP workspaces you would like to convert, with the file name and path name of the desired output file on the same line. A sample batch text file is included below.

```
d:\nhd\nhdgeoinshp\03070102 d:\nhd\projectednhdgeoinshpa\03070102prj  
d:\nhd\nhdgeoinshp\03140201 d:\nhd\projectednhdgeoinshp\03140201prj
```

Once you have created a text file with this format, you can run the Projection Utility in batch mode.

Step 1. Go to your ArcView project window. Select *Scripts* in the project window and click **New** (Figure 7).

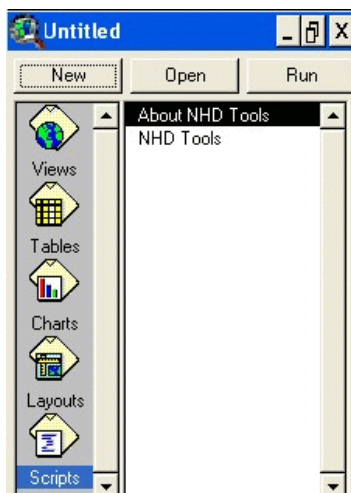


Figure 7. ArcView project window

- Step 2.** Select *Load System Script...* from the *Script* menu and scroll down to the script called **nhdprj.batchrun** and click **OK** (Figure 8).

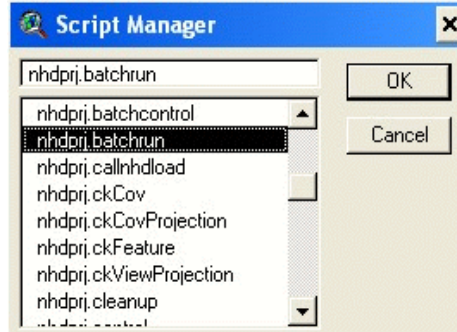


Figure 8. Script Manager dialog box.

- Step 3.** You can use this script to run your batch projection job by modifying it in three places that are marked with asterisks. The first part of the code you need to change is the pathname for your batch file.

Code Sample

```
'-----
***** 1) Replace path name in the following line with the name ****
***** and location of your text file containing the list of coverage/shapes ****
myfromFile = ("d:\projects\nhd\batchlist.txt").asfilename
'-----
```

In the code, replace “d:\projects\nhd\batchlist.txt” with the pathname for the batch text file you created.

- Step 4.** The next parameter you need to change is the location where you would like the Projection Utility to store the output log text file. When you run the Projection Utility in batch mode, it will not display any errors encountered during the conversion, but it will write them to a log file. It is a good idea to review this log file after each batch conversion.

Code Sample

```
'-----
***** 2) Replace path name in the following line with the name ****
***** and location you want to use for the log file ****
logfile = "d:\projects\nhd\nhdcovdata\logfile.txt"
'-----
```

In the code, change “d:\projects\nhd\nhdcovdata” to the pathname where you would like the output log file to be stored.

- Step 5.** The last parameter you need to define is the desired projection. If your data are Geographic, you can choose to project the workspaces to the current View projection, National Albers, or your own defined projection (please see the ArcView help files for details on defining your specific projection).

Code Sample

```
'-----
***** 3) Indicate the projection in the following line *****
***** Do not use Nil! *****
' Get the projection from your View

myProjection = av.getproject.finddoc("View1").getprojection

' Or Define a projection

arect = rect.makexy(-2500000,221000,2400000,3500000)
Albersprj = Albers.make(arect)
Albersprj.setCentralMeridian(-96)
Albersprj.setReferenceLatitude(23.0)
Albersprj.setLowerStandardParallel(29.5)
Albersprj.setUpperStandardParallel(45.5)
Albersprj.setFalseEasting(0)
Albersprj.setFalseNorthing(0)
Albersprj.setSpheroid(#SPHEROID_GRS80) ' equals NAD83

myProjection = AlbersPrj

'-----
```

In the code sample above, ArcView will ignore lines of text that start with a single quote ('). If you wish to use the View projection, remove the single quote (') from the “myProjection = av.getproject.finddoc("View1").getprojection” line and add a single quote (') to the lines that pertain to the Albers projection (“arect = rect.makexy(-2500000,221000,2400000,3500000” through “myProjection = AlbersPrj”).

- Step 6.** Choose *Compile* from the *Script* Menu. If your script compiles successfully, then select *Run* from the *Script* menu. ArcView will convert the workspaces listed in your batch text file.

NHDGEOinSHP Reach Indexing Tool (RIT)

Overview

Georeferencing is the process of locating an entity in real world coordinates. An example would be obtaining latitude and longitude coordinates for a person's home. Reach indexing is the process of georeferencing surface water entities, like Clean Water Act Section 303(d) waterbodies, to a spatial database such as NHD. The RIT is designed to provide an interactive geographic information system (GIS) interface to assist you with the georeferencing process. The RIT is ideal for indexing any surface water entity, from habitat types to point source dischargers to fish consumption advisories.

What does the RIT do?

There are many kinds of surface water data (such as Fish Consumption Advisories or habitat types) that are suitable for mapping to a GIS hydrography coverage. One method for associating attributes with an existing coverage is to create additional fields in the coverage attribute table and populate those fields with the desired values. The problem with this methodology is that modifying the NHD attribute tables destroys the integrity of the nationally consistent coverage. If many programs modify the NHD attribute tables in different ways, these data become difficult to compile and analyze. Also, if the spatial structure of NHD is modified by an individual user, the function of the NHD Reach Codes as unique location data for individual reaches is destroyed. ***Therefore, it is undesirable to modify the underlying structure of NHD.***

The RIT uses the dynamic segmentation data model available in ArcView. This data model allows entities to be related to spatial database components (NHD reaches) without editing the spatial objects themselves. The dynamic segmentation model is based on the idea that attributes of a feature can be displayed by simply specifying the start and end points of the feature along an arc, instead of joining the attributes directly to the arc attribute table. The start and end points of these dynamic segments are stored in the "F_meas" (From measure) and "T_meas" (To measure) fields in the RIT event table. The linear events are displayed as linear features along the reach. The dynamic segmentation model can be used to georeference point or linear features to a routed linear coverage. Point event features have a single measured position (P_meas) instead of a "To" and "From" measurement and are displayed as a single point on a reach. Each record in the event table displays as an "event". The use of events allows users to index multiple entities to the same NHD reach or set of reaches. It also allows the user to index an entity to a portion of a reach without having to modify the spatial extent of the reach itself.

The RIT automates the process of creating NHD event tables and georeferencing surface water entities. It is designed for users who are familiar with ArcView. The RIT can be used by any organization that has a mandate to monitor and track surface water information. The NHD event tables created by the RIT provide three fields to store attribute data entered by the user: Entity ID, Attribute Program, and Attribute Value. Entity ID is frequently used to store a unique identifier for a surface water entity (like a Fish Consumption Advisory) that can be linked to an outside database that contains detailed information about the entity. Attribute Value can be used to store a nonunique descriptor about the surface waters, such as habitat type or substrate. Attribute Program can be used to identify the agency or

program that is the source of the information. More information about georeferencing concepts is available on the Internet at <http://www.epa.gov/owow/monitoring/georef>.

RIT Functionality

The RIT can create two main types of themes:

- Event and waterbody themes georeferenced to NHD and
- Custom Shape Themes to represent features that are not represented in NHD.

With the RIT you can create and manipulate three kinds of themes georeferenced to NHD:

- **Linear event themes**, which are georeferenced to the NHDFlowline Theme,
- **Point event themes**, which are georeferenced to the NHDFlowline Theme, and
- **Waterbody themes**, which are created using the NHDWaterbody Theme.

The linear and point event themes use the dynamic segmentation model for display. Linear event tables contain fields for the NHD reach code and To and From positions along the reach, which allow the event segment to display.

Selected Fields from a Linear Event Table

F_meas	T_meas	Rch_code	Attr_prg	Attr_val	Entity_ID	State
0.00	100.00	07100005000296	Program	Value	Unique Identifier	ST
0.00	50.00	07100005000297	Program	Value	Unique Identifier	ST

F_meas and T_meas are the “from” and “to” measure fields, respectively. Typically, the measures along an NHD reach go from 0.00 to 100.00. When the from and to measures in the event table vary from these values, you know that only a portion of a reach has been indexed.

Point event tables are similar to linear event tables, except that instead of a “from” and “to” measure, they have a single P_meas, or “point” measure. This value identifies where along a reach a point should display.

Selected Fields from a Point Event Table

P_meas	Rch_code	Attr_prg	Attr_val	Entity_ID	State
56.69	07100005000296	Program	Value	Unique Identifier	ST

The areal features in NHD (polygons) that represent lakes and reservoirs are referred to as “waterbodies” in NHD. There is no dynamic segmentation model for polygons, so the RIT allows you to reach index NHD waterbodies by creating a waterbody shapefile. The table structure for the waterbody shapefile is similar to those for linear and point events, but there are no measure fields.

NHDGEOinSHP Reach Indexing Tool

It is important to note that linear and point event themes are simple dbase files (*.dbf) that ArcView can display using the NHDFlowline theme. The waterbody theme created by the RIT is a shapefile and requires all of the component files (*.shp, *.shx, *.dbf) for display in ArcView.

You can also create custom shape themes for points, lines, or polygons. The standard fields in the custom shapefiles are similar to the event and waterbody tables, except that there are no NHD reach code values or measures.

Using the RIT

After you have installed the NHDGEOinSHP Toolkit, the NHDGEOSHP version of the RIT is available as an ArcView extension. To activate the RIT, choose ***Extensions...*** from the ***File*** menu. Scroll down until you see **NHDGEOSHP Reach Indexing Tool**. Check the associated check box and click **OK**.

When you open a new View, you will see the ***NHD-RIT*** menu, as well as the ***NHD_Tools*** menu and several new buttons and tools (NHDGEOinSHP Toolkit buttons and tools have blue icons). See the Function Reference section of this User's Guide for detailed descriptions of each menu, button, and tool.

Before you can use the RIT, you need to load an NHDGEOinSHP workspace to georeference surface water entities to. Loading the RIT automatically adds the Load/Unload NHDGEOSHP Workspace extension. When loading NHDGEOinSHP workspaces for reach indexing, performance time of the RIT is greatly improved if you choose Reach Indexing Themes, Tables and Links.

Loading an NHDGEOinSHP Workspace for Reach Indexing

- Step 1.** Choose ***Load NHDGEOSHP Workspace*** from the ***NHD_Tools*** menu. Navigate to the "openme.txt" file located in the directory for your NHDGEOinSHP workspace.
- Step 2.** When prompted to select a **Load Type**, choose **Reach Indexing Themes, Tables, and Links** and click **OK**.

Now that you have loaded an NHDGEOinSHP workspace into your View, you can create a new event theme or load an existing event theme into the project.

Creating a New Event/Waterbody Theme

- Step 1.** Once you have added the **NHDFlowline** and **NHDWaterbody** themes to your View, you can create a new event table by selecting NHDFlowlines and choosing one of the RIT Add tools. The procedure varies slightly depending on the type of event table (linear, point, or waterbody) you want to create.

Adding events to a new linear event theme. Make the **NHDFlowline Theme** active and select the flowlines you want to reach index. Click on the **Add Linear Event(s) or Entire Waterbody(ies)** button (shown below), or choose ***Add Linear Event(s) or Entire***

Waterbody(ies) from the pop-up menu that is activated by right clicking on the View to create the new events. Proceed to Step 2.



Adding events to a new point event theme. Make the **NHDFlowline Theme** active and click on the **Add Point Event on Reach** button (shown below). Click on the location where you want to create a point. Proceed to Step 2.



Adding waterbodies to a new waterbody theme. Make the **NHDWaterbody Theme** active, click on the **Select Entire Waterbody(ies)** button (shown below), then draw a polygon around the lake(s) of interest. Each time you click, another vertex will be added to your selection polygon. Double click when you are finished. Alternatively, you can add lakes by selecting them using the ArcView **Select Feature** tool and using the **Add Linear Event(s) or Entire Waterbody(ies)** button or pop-up menu choice.



Step 2. You will be notified that no event table exists for the current route (Figure 9).



Figure 9. Select or create event table message.

Click **OK** and you will be prompted to create one. On the next dialog, make sure the **Create New Event/Waterbody** table radio button is selected and click **OK**.

Step 3. You will be prompted to select or enter an ID for the new events. If you have a table with IDs that you would like to use, see the section on Using an ID List in this document. Enter or select the appropriate values and click **OK**.

Step 4. You will then be prompted to choose a storage location for your new event table. You can assign the new event/waterbody table any name you like. The RIT will suggest the following default names listed below.

Table Feature Type	Default Name
Linear Event Table	<NHDworkspaceName>L.dbf
Point Event Table	<NHDworkspaceName>P.dbf
Waterbody Table	<NHDworkspaceName>W.dbf

Make the appropriate changes to the dialog and click **OK**.

*Note: If an event/waterbody table with the same name as the one you are creating already exists in your working directory, the RIT will prompt you to see if you want to overwrite the existing table. If you choose **Yes**, then the existing event table will be deleted, as well as any other files in your working directory that have the same prefix. For example, if an event table named “303dwaters.dbf” is deleted, any file with that name as a prefix (like “303dwaters_list.dbf”) will also be deleted.*

Step 5. If this is the first event/waterbody theme that you are working with in the View and you are working with Geographic data (decimal degrees), you will be prompted to choose a projection for your View. The View projection you select will not affect the underlying data. (Do not worry if you are not prompted about this).

Step 6. Next you are prompted to create metadata for the event table. Click on the **Create New** button. You will be prompted to enter **User Information**. If you have not used the RIT before on the computer where you are working, you will need to enter your user information. Otherwise, you can select your name from the list of users (Figure 10).

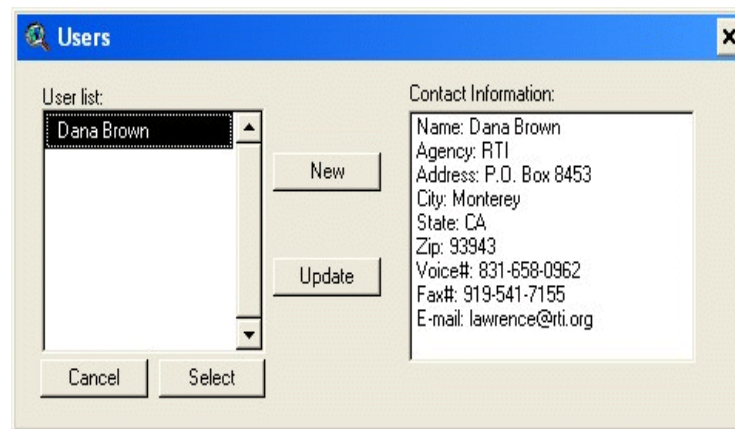


Figure 10. Users dialog box

Enter or select the user information as appropriate and click **Select**. The “Create new metadata entry...” dialog opens (Figure 11).

Figure 11. Metadata dialog box

You must fill this information out completely, including adding a source by clicking on the **Add Source** button. The **Add Source** button will open a dialog that will allow you to choose an existing source entry, or create a new entry (Figure 12).

Figure 12. Sources list.

Either select an existing source and click **Select** or click **New** to create a new entry. After you have entered the information for a new source entry, click **OK**, then click **Select** on the “Sources” dialog. If you would like to enter multiple sources for your indexing, you can

modify the percent contributed by each source by double clicking on the source name in the “Create New Metadata...” dialog.

When you have finished entering metadata, click **OK** on the “Create new metadata...” dialog. The new event/waterbody table will be created and your event/waterbody theme will be added to your View. Your new event/waterbody theme will have the same name in the View as the event table you created.

- Step 7.** To continue working in your new event/waterbody theme, continue to select flowlines in the **NHDFlowline Theme** or the **NHDWaterbody Theme** and use the appropriate **Add** tool for the desired feature.

Adding an Existing Event/Waterbody Theme

- Step 1.** If you downloaded event tables from the Web or acquired them from another RIT user, the event tables may be in bundled format (EventTableName.zip). If this is the case, run **Import Bundled Files** from the **NHD_Tools** menu. Otherwise move on to Step 2.

To use **Import Bundled Files**, select it from the **NHD_Tools** menu and use the dialog to navigate to the location of your .zip files. Select the bundles you want to import and click **OK**.

- Step 2.** Before you can add an existing event/waterbody theme to your View, you need to have an NHDGEOinSHP workspace in your View that contains the reaches your indexing work is georeferenced to. Use **Load/Unload NHDGEOSHP Workspace/(s)** to load the **NHDGEOinSHP** themes to your View.
- Step 3.** Choose **Load NHD Event Theme** from the **NHD-RIT** menu. Make sure the **Load Existing Event/Waterbody Table** radio button is selected on the “Select/Load event/waterbody table” dialog and click **OK**.
- Step 4.** Navigate to the event/waterbody table you would like to load and click **OK** (Figure 13).

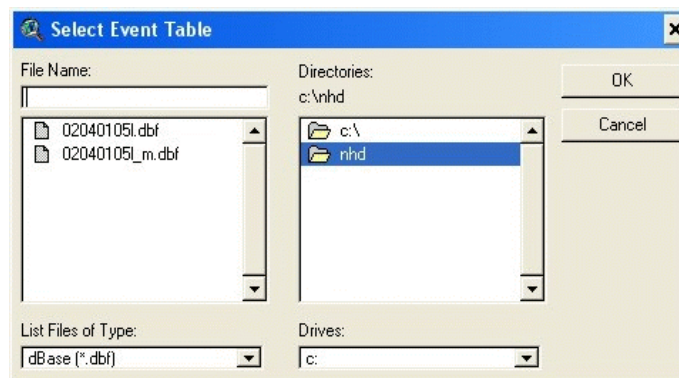


Figure 13. Select the event table to load into the View.

Choose the correct event or waterbody table and click **OK**.

- Step 5.** The first time you edit an event theme, you will be prompted about metadata. To continue to use the metadata information that is already associated with the event table, select the existing entry and click **Select Entry**. To modify the existing metadata information, click **Update Entry**. To create new metadata information (perhaps for a new data source) click **New Entry**. You can also view the user and source Information from this dialog (Figure 14).

Metadata entries for 020401011.dbf

Meta data entries:

020401011.dbf

New Entry Update Entry Delete Entry

Originator: RTI

Purpose: 303(d)

Progress: In work

Update Frequency: As needed

Process: Manual conflation

Contact Person: Dana Brown

Time period data applies to: 2004

Keywords:

1. 303(d) 3. water quality limited streams 5. impaired

2. TMDL 4. threatened

Locational Keywords:

1. LA 2. 3.

Source Details

Contact Detail

Cancel Select Entry

Figure 14. Existing metadata information

Editing Event/Waterbody Themes

In ArcView, when dealing with themes in a View, operations must be performed on themes that are “active.” The RIT employs a similar concept for keeping track of the event theme you would like to edit. When you make the **NHDFlowline** theme or the **NHDWaterbody** theme active, the RIT displays the name of the currently editable theme in the View title bar (Figure 15).



Figure 15. The current theme is listed at the top.

The RIT will also let you know which theme is being edited in the **Choose ID** dialog when you are adding new events/waterbodies (Figure 16).

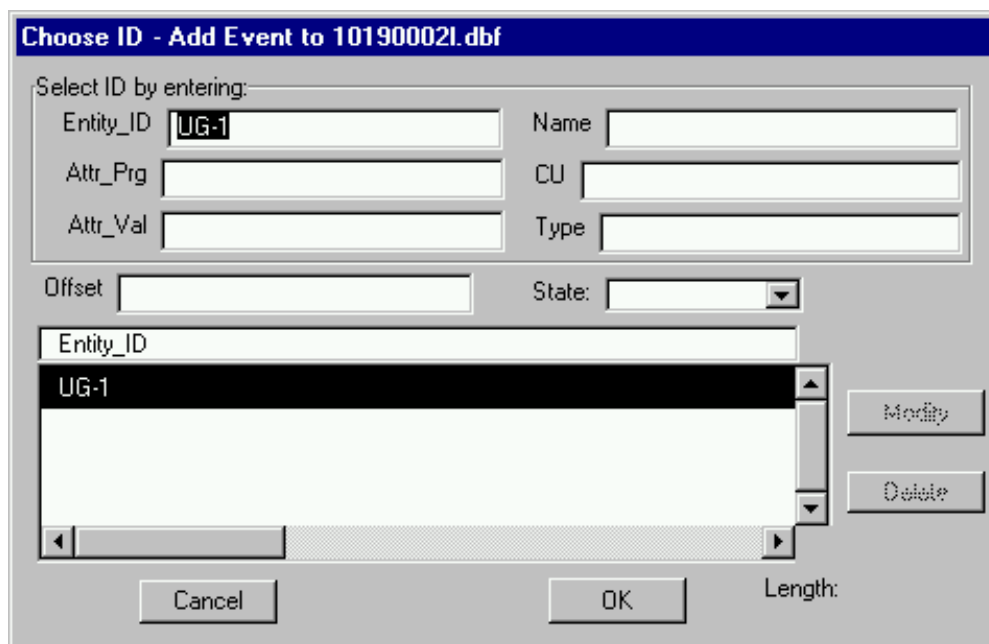


Figure 16. Choose ID dialog

If you need to change the editable event/waterbody theme associated with an NHDGEOinSHP workspace, and the event/waterbody theme you want to edit is already in your project, choose **Load NHD Event Theme** from the **NHD-RIT** menu. Select the event/waterbody theme you wish to edit from the list box in the lower portion of the dialog and click **OK**. When you “create new” or “load existing” event/waterbody themes to the View, they are automatically set to the editable theme.

Sometimes the RIT is unable to determine which event/waterbody theme you wish to edit. An example would be when you add a feature for which there is no current event theme in the View (you try to add a point event, but there are no point event themes in your View). You will get a message box similar to Figure 17.



Figure 17. No corresponding event types message

When you click **OK**, you will be able to create a new event/waterbody theme, load an existing theme into the project, or select an event theme that is already available in the View.

Editing Values in the Event/Waterbody Table

You can use the Event Editing Tool Box to change the current Entity ID, Attribute Value (Attr_val), or Attribute Program (Attr_prg) values you have reach indexed in your Event/Waterbody table.

- Step 1.** Make the Event/Waterbody table active and select the entities you wish to modify.
- Step 2.** Click on the **Edit Events/Waterbodies** button (shown below), or choose *Edit Events/Waterbodies* from the pop-up menu that is activated by right clicking in the View.



This activates the Event Editing Tool Box (Figure 18).

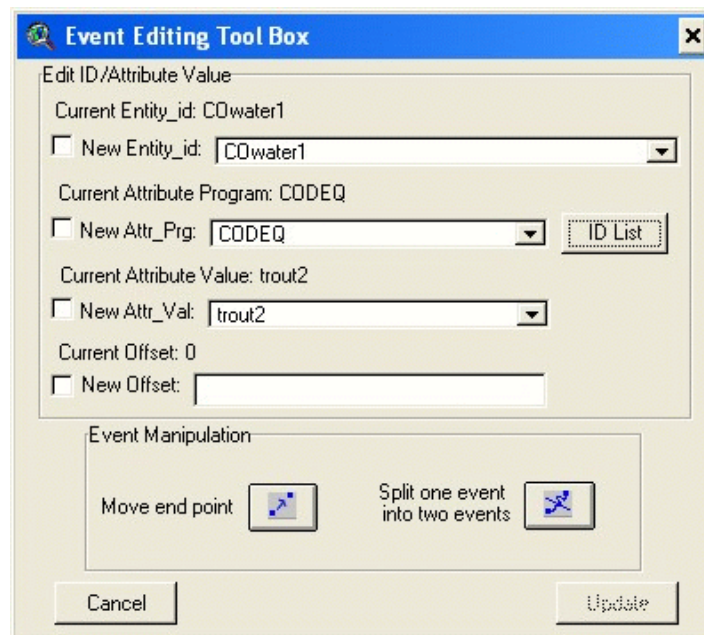


Figure 18. Event Editing Tool Box

Step 3. Use the drop-down lists to change the values of any of the attribute fields, or type in a new offset value. Only values that are marked in the check box will be modified when you click **Update**. If you wish to add new values, click on the **ID List** button to call the “Choose ID” dialog.

Changing the Spatial Extent of Linear Events

You can also use the Event Editing Tool Box to modify the spatial extent of existing events. You can perform two spatial modifications:

- Move the end point on an existing linear event
- Divide one event into two events, with the option of giving a new ID to either or both new sections.

Moving End Points

- Step 1.** Make the linear event theme active and select the linear event you would like to modify (select only one segment).
- Step 2.** Click on the **Edit Events/Waterbodies** button to activate the **Event Editing Tool Box**.
- Step 3.** Click on the **Move Endpoint** button. The RIT will display the current endpoints of the selected events (Figure 19).

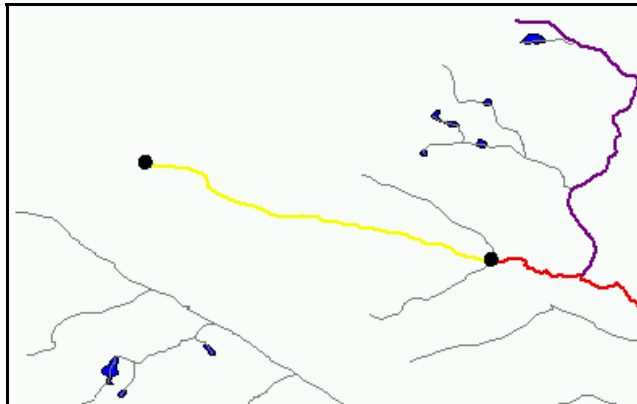


Figure 19. Endpoints of selected event

(Note: You may need to move the Event Editing Tool Box dialog out of the way to see the endpoints.)

Step 4. Click on the location that you would like to move the end point to. The RIT will select the endpoint closest to the location you clicked and ask if it is the endpoint you would like to move.

Step 5. If the selected endpoint is the correct one, click **Yes** and the end point will be moved to the desired location. If the incorrect end point is selected, click **No** and the RIT will select the other end point and ask again. Click **Yes** to move that end point to the location indicated.

Splitting One Event into Two

Step 1. Make the linear or waterbody theme active and select the event you would like to split into two (select only one event).

Step 2. Click on the **Edit Events/Waterbodies** button to activate the Event Editing Tool Box.

Step 3. Click on the **Split One Event into Two Events** button. For linear events, click on the location where you would like to divide the event (you may need to move the Event Editing Tool Box out of the way to do this). For waterbody themes, use the mouse to draw a line where you would like to split the polygon by clicking at the beginning of the line and double clicking at the end of the line.

- Step 4.** The RIT will divide the segment, select one part, and ask if you would like to change the attribute values that are currently assigned to the new event (Figure 20). If you click **Yes**, you will be able to enter/select new values using the “Choose ID” dialog. If you click **No**, the values will remain unchanged.

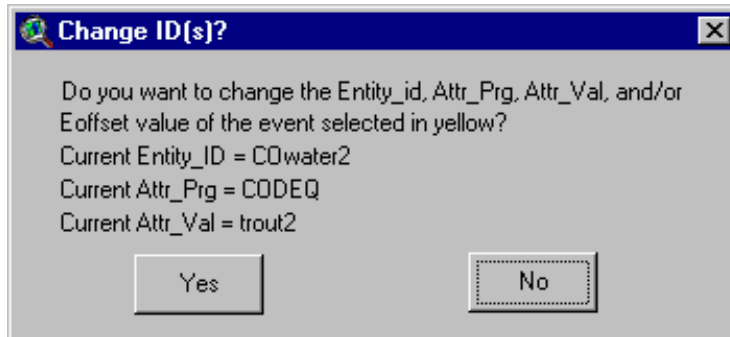


Figure 20. Change ID dialog during split events

- Step 5.** The RIT will then select the other part of the split event and ask if you would like to change the attribute values.
- Step 6.** Even if you do not change the attribute values of either piece, the original event will now exist as two separate events.

If you split an event in error, or wish to merge contiguous events that lie on the same reach, you can use Merge Events. To use this feature, select the events that you would like to merge and select **Merge Events** from the **NHD-RIT** menu. Merge Events will only work if the selected events have the same Entity_ID, Attribute Value, and Attribute Program.

Deleting Events/Waterbodies

You can delete events or waterbodies by selecting them and clicking on the **Delete Events/Waterbodies** button.



Delete events/waterbodies is also available from the pop-up menu that is activated when you right click on the View.

If you delete all of the events in an event/waterbody table, the event table and associated files should be deleted from the disk. Sometimes the RIT can not delete these files because they are in use by ArcView. If this occurs you will be presented with a message box that tells you which files could not be deleted. You should delete them after you have completed your indexing session and closed ArcView.

The RIT also offers an Undo Delete function. Undo Delete will restore the events/waterbodies from your most recent delete. Undo Delete also restores the associated metadata files. Undo Delete is available as a button and from the *NHD-RIT* menu.



Copying Events

In some cases, you may need to assign more than one set of attributes to the same area of stream. You can represent these areas in linear event tables by creating multiple events on the same NHDFlowline and then defining an offset value, so that the copy will display along side of the original reach (Figure 21). There are two ways to create copied events.



Figure 21. An offset event

Option 1. Make the event table active, select the events you would like to copy, and select **Copy Events** from the *NHD-RIT* menu, or from the pop-up menu that is activated by right clicking on the View. Assign the appropriate attribute values and be sure to set an **Offset** value (see information about offset values below).

Or

Option 2. Make the **NHDFlowline** theme active, select the area you wish to copy, and use the **Add Linear Event(s) or Entire Waterbody(ies)** button, or select it from the pop-up menu that is activated by right clicking on the View. Assign the appropriate attribute values and be sure to set an **Offset**.

The Offset value that you set depends on your View projection units. If you wish to display multiple copies of a single event, simply set different offset values. If you set a negative offset value, it will display the copy on the other side of the original reach. The following values are recommended. They can be modified as necessary to achieve the desired display.

View Projection Units	First Offset	Second Offset	Third Offset
Decimal Degrees	.001	.002	.003
Meters	100	200	300
Feet	300	600	900

Note: The offset value stored in your event table's "eoffset" field is stored in workspace units, but you enter the offset value in View units. If your View is not projected, then workspace units are the same as view units.

Due to a known problem with ArcView, offset events do not always display. You will have the best success if you work in the same View projection as your data projection.

To force offsets to draw, make the linear event theme active and click the **Draw Offsets** button or select **Draw Offsets** from the **NHD-RIT** menu. Then click ArcView's **Clear Selected Features** button and your offsets will display.

Special Tools for Adding Events/Waterbodies

Two special tools allow you to add a partial waterbody and add offset points.

Add Partial Waterbody - The Add Partial Waterbody feature allows you to index only a portion of a lake. You might wish to do this if there is a change in the lake composition or a change in jurisdiction. The **Add Partial Waterbody** button is available as a drop-down tool below the **Add Waterbody(ies)** button.



Step 1. Make the **NHDWaterbody** theme active and click the **Add Partial Waterbody** button.

Step 2. Draw a polygon around the lake area of interest. Each time you click, another vertex will be added to your selection polygon (be sure to include only one lake in your selection polygon). Double click when you are finished.

You can merge contiguous partial waterbodies on the same waterbody reach using the Merge Events feature. To use this feature, select the waterbodies that you would like to merge and select **Merge Events** from the **NHD-RIT** menu. You can only merge waterbodies that have the same Entity_ID, Attribute Value, and Attribute Program.

Add Offset Points - You may wish to index a point that does not lie directly on an NHD stream. You can use the Add offset point tool to reach index these areas. Add offset point is available as a drop-down tool below the Add Point Event on Reach button.






- Step 1.** Make the **NHDFlowline** theme active and click the **Add Offset Point** button.
- Step 2.** Click on the location where you would like to add a point. The RIT will add a point at the selected location. The new point will be georeferenced to the nearest NHDFlowline.

Creating a New Custom Shape Theme

You can create a Custom Shape Theme in your RIT project by using one of the Add tools from the Custom Shapes tool drop-down.



-  **Add Custom Point**
-  **Add Custom Line**
-  **Add Custom Polygon**

Custom Shapes Tool Drop-Down

- Step 1.** Click on one of the **Add Custom Shape** tools and draw the feature you want to add. If you are using the **Add Custom Line** or **Add Custom Polygon** tool, click once and drag to make the shape. Click once each time you want to add a vertex, and double click when you are finished. You can also create a new custom shapes theme by selecting features in an existing theme and clicking on the **A** button.
- Step 2.** You will be prompted to create a new custom theme. Make sure the **Create new Custom Theme** radio button is selected and click **OK**.

Step 3. You will be prompted to select a storage location for your new custom theme. You can name your custom theme anything you like. The default name is Custom_<feature type>.shp. Make the appropriate changes to the dialog and click **OK**.

Step 4. If there are no other RIT themes in your view, you will be prompted to enter projection information for your new shapefile. Select your desired projection and click **OK**. You will then be prompted for projection units and datum. Make the appropriate selections.

If there are other RIT themes in your View, then your new theme will have the same projection information as the other themes in your View.

Step 5. Next you will be prompted to select or enter an ID for the new shape. Enter or select the appropriate values and click **OK**.

Step 6. You are then prompted to create metadata for the new custom shapefile. Click on the **Create New** button. You will be prompted to enter **User Information**. If you have not used the RIT before on the computer on which you are working, you will need to enter your user information. Otherwise, you can select your name from the list of users (Figure 22).

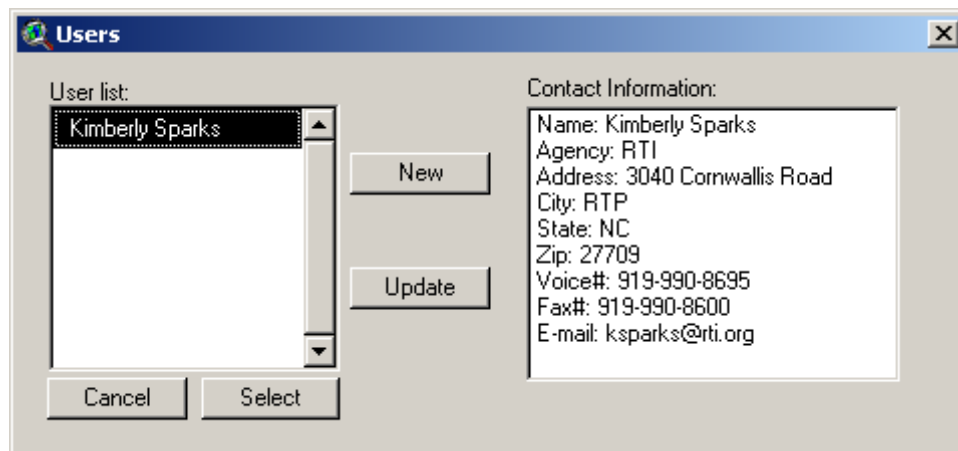
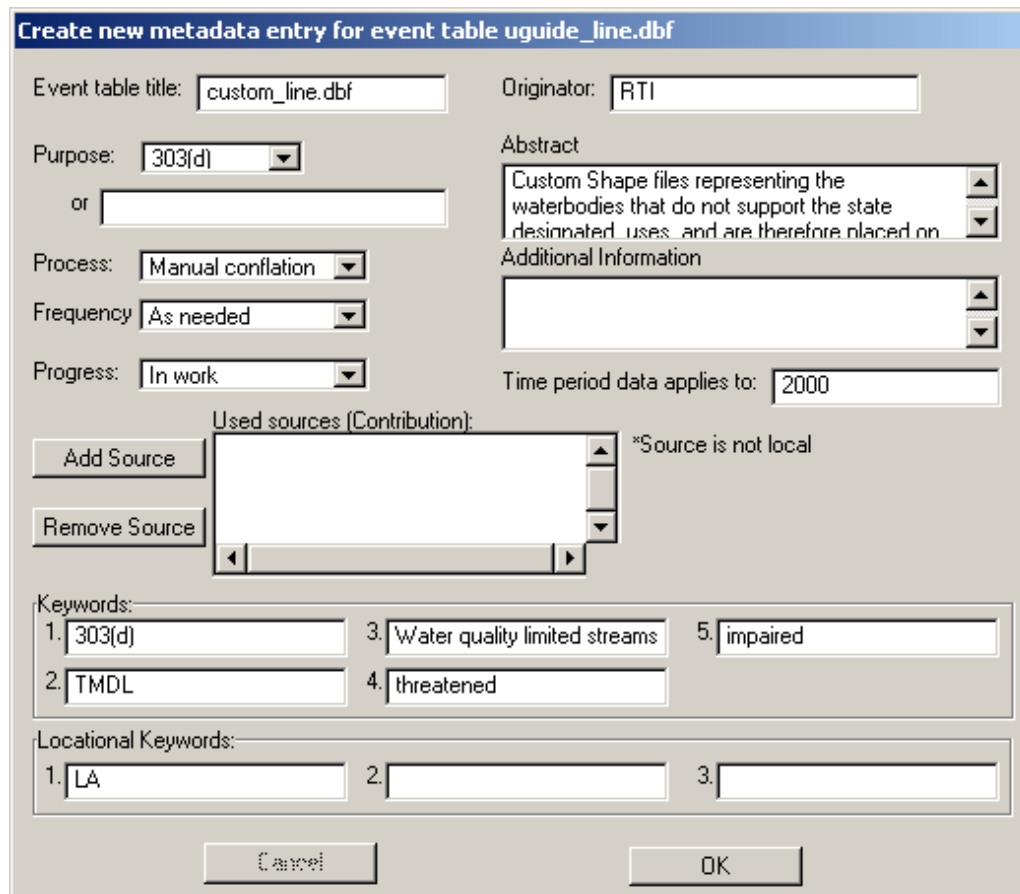


Figure 22. List of users

Enter or select the user information as appropriate and click **Select**. The “Create new metadata entry...” dialog opens (Figure 23).



Create new metadata entry for event table uguide_line.dbf

Event table title: Originator:

Purpose: or

Process: Abstract: Additional Information:

Frequency: Time period data applies to:

Progress:

Used sources (Contribution): *Source is not local

Add Source Remove Source

Keywords:

1. 3. 5.

2. 4.

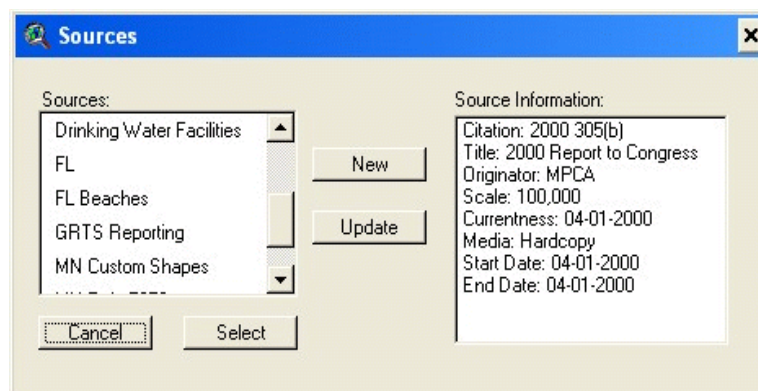
Locational Keywords:

1. 2. 3.

Cancel OK

Figure 23. Create new metadata dialog

You must fill out this information completely, including adding a source by clicking on the **Add Source** button. The **Add Source** button will open a dialog that will allow you to choose an existing source entry or create a new entry (Figure 24).



Sources

Sources:

- Drinking Water Facilities
- FL
- FL Beaches
- GRTS Reporting
- MN Custom Shapes

New Update

Cancel Select

Source Information:

Citation: 2000 305(b)
 Title: 2000 Report to Congress
 Originator: MPCA
 Scale: 100,000
 Currentness: 04-01-2000
 Media: Hardcopy
 Start Date: 04-01-2000
 End Date: 04-01-2000

Figure 24. Sources dialog box

Either select an existing source and click **Select**, or click **New** to create a new entry. After you have entered the information for a new source entry, click **OK**, then click **Select** on the “Sources” dialog. If you want to enter multiple sources for your work, you can modify the percent contributed by each source by double clicking on the source name in the “Create New Metadata...” dialog.

When you have finished entering metadata, click **OK** on the “Create new metadata...” dialog. The new custom shapefile will be created and your custom shape theme will be added to your View. Your new event/waterbody theme will have the same name in the View as the custom shapefile you created.

- Step 7.** To continue working on your new custom shape theme, you can either use the add shape tools to add additional features, or you can select features in existing shapefiles and use the **Add** button (“A”) to add them to your custom shapes theme.

Loading an Existing Custom Shape Theme

- Step 1.** If you downloaded custom shapefiles from the Web or acquired them from another RIT user, the files may be in bundled format (customshapefilename.zip). If this is the case, run **Import Bundled Files** from the *NHD_Tools* menu. Otherwise, move on to Step 2.

To use **Import Bundled Files**, select it from *NHD_Tools* menu and use the dialog to navigate to the location of your .zip files. Select the bundles you want to import and click **OK**.

- Step 2.** Choose **Load Custom Shape Theme** from the *NHD-RIT* menu. Make sure the **Load Existing Custom Theme** radio button is selected on the “Create a Custom Theme” dialog and click **OK**.

- Step 3.** Navigate to the custom shapefile you want to load and click **OK**.

- Step 4.** The first time you edit a custom shapefile with the RIT, you will be prompted about metadata (Figure 25). To continue to use the metadata information that is already associated with the custom shape theme, select the existing entry and click **Select Entry**. To modify the existing metadata information, click **Update Entry**. To create new metadata information (perhaps for a new data source), click **New Entry**. You can also view the user and source information from this dialog.

Metadata entries for custom_line.dbf

Meta data entries:

- custom_line.dbf

New Entry Update Entry Delete Entry

Originator: RTI

Purpose: 305(b)

Progress: In work

Update Frequency: As needed

Process: Manual conflation

Contact Person: Kimberly Sparks

Time period data applies to: 2000

Sources used (Contribution):

- Idaho WQS Coverage (100%)

Source Details

Contact Detail

Keywords:

- 1. 305(b)
- 2. Water quality assessments
- 3. monitoring
- 4.
- 5.

Locational Keywords:

- 1. ID
- 2.
- 3.

Cancel Select Entry

Figure 25. Existing metadata for custom line

Editing Values in the Custom Shape Theme

You can change the current Entity ID, Attribute Value (Attr_val), or Attribute Program (Attr_prg) values you have reach indexed in your Custom Shape theme using the Event Editing Tool Box.

- Step 1.** Make the Custom Shape theme you wish to edit active and select the entities you wish to modify.
- Step 2.** Click on the **Edit Events/Waterbodies** button, or choose **Edit Events/Waterbodies** from the pop-up menu that is activated by right clicking in the View.



This activates the Event Editing Tool Box (Figure 26).

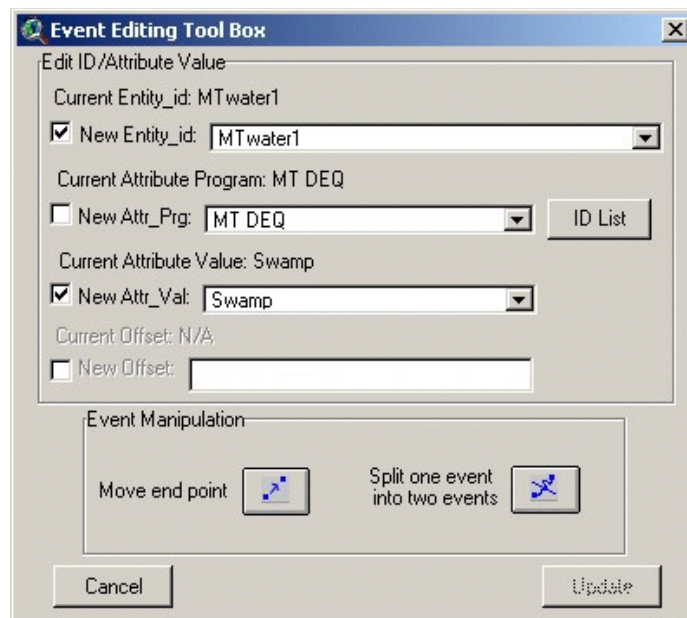


Figure 26. Event editing toolbox

Step 3. Use the drop-down lists to change the values of any of the attribute fields, or type in a new offset value. Only values that are marked with a checkbox will be modified when you click **Update**. If you wish to add new values, click on the **ID List** button to open the “Choose ID” dialog.

Changing the Spatial Extent of Custom Shapes

You can change the spatial extent of Custom Lines or Polygons by splitting them in two or by merging them together. These split and merge tools are shown below.



Split Custom Line



Merge Custom Lines



Split Custom Polygon



Merge Custom Polygons

Custom Shapes Tool Drop-Down

Step 1. Make the Custom Line or Polygon theme active and select the shape you would like to split into two (select only one).

- Step 2.** Click on the appropriate splitting tool from the **Custom Shapes Tool** drop-down. Click with this tool near the location where you want to make the split, hold your mouse button down, and drag it across to define the split. Double click when you are finished.
- Step 3.** The RIT will divide the segment, select one piece, and ask if you would like to change the attribute values that are currently assigned to the new event (Figure 27).

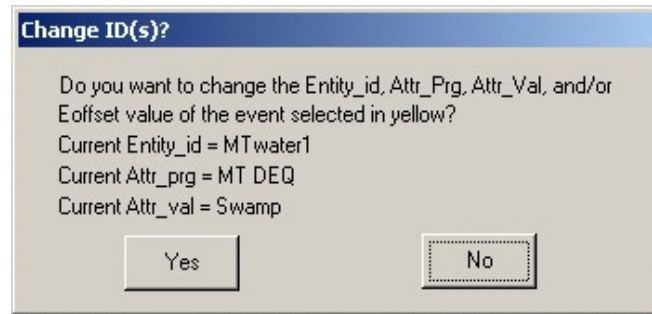


Figure 27. Change ID dialog box

- If you click **Yes**, you will be able to enter or select new values using the “Choose ID” dialog. If you click **No**, the values will remain unchanged.
- Step 4.** The RIT will then select the other piece of the shape and ask if you would like to change the attribute values. Even if you do not change the attribute values for either piece, the original shape will now exist as two separate features.

If you split a custom shape in error or wish to merge shapes, you can use the custom shapes merge tools. Select the shapes you would like to merge, then select the appropriate tool. The merge tools will only work on custom shapes that have the same Entity_ID, Attribute Value, and Attribute Program.

Deleting Custom Shapes

You can delete custom shapes by selecting them and clicking on the **Delete Events/Waterbodies** button.



Delete Events/Waterbodies is also available from the pop-up menu that is activated when you right click on the view.

Using Navigate with the RIT

You can add navigation results from the Navigate extension to an NHD event table that you have created or loaded using the RIT. After you have performed a navigation, click on the **Add Linear Event(s) or Entire Waterbody(ies)** (blue A icon) button. Select or enter an Entity ID, Attribute Value, and Attribute Program when prompted, and click **OK**. Your navigation will be added to the event table.

Other Features

Using an ID List

As you reach index, it can be helpful to work with a list of values you want to use in your event tables to prevent a lot of repetitive typing and typographic errors. The RIT allows you to use a list contained in a dbase file you have created or to link to a table in a database that has IDs that you want to use. The RIT can also create a file and build the list as you work, or you can choose to work without a list. The dbase file that contains the IDs is referred to as an ID list. An ID list has six fields that the RIT can use:

- | | |
|---------------------|--------------------------------|
| ■ Entity ID | ■ Name |
| ■ Attribute Value | ■ USGS 8 digit Cataloging Unit |
| ■ Attribute Program | ■ Type |

Entity ID, Attribute Value, and Attribute Program are the only values that are actually stored in the event table. The other three fields (Name, USGS Cataloging Unit, and Type) are available to aid you in selecting the correct values from the list (it is much easier visually to search for a stream name than an Entity_ID). There are no required naming conventions for fields in the ID list.

The RIT offers five options for working with an ID list (Figure 28). The default is to work without a list (No List). If you wish to use another method, choose **Change ID List** from the *NHD-RIT* menu.

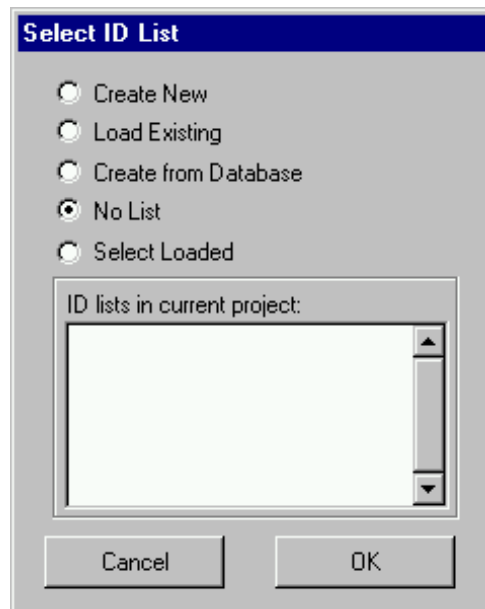


Figure 28. Select ID list dialog

The ID list options are as follows:

- **Create New**—You do not currently have an ID list, but you would like the RIT to create one for you. The RIT will build a table with records for each combination of values (Entity_ID, Attr_prg, and Attr_val) that you enter. When you choose this option, you will be prompted to select a name and directory location for your ID list. The RIT will also allow you to choose the field names in the ID list. This option will only require you to enter new values one time, after which you can select them from your list.
- **Load Existing**—You already have a table with Entity IDs or attribute values you want to use in your event table. This dbf file can have any name, and there are no required naming conventions for the fields in the table. When you load an existing table, you are prompted to define which field corresponds with which event table value. *Note: The fields that represent Entity_ID, Attr_Val, and Attr_prg in your ID list must be character fields. You will get an error if they are numeric fields.*
- **Create From Database**—This option allows you to extract an ID list from an existing database like the TMDL Tracking System or the 305(b) Assessment Database. To use this feature, you need to create an ODBC (Open Database Connectivity) data source for the database you want to use. When you select **Create From Database** from the **NHD-RIT** menu, you need to select the datasource, then select the table within that database that you want to use. You will be prompted to specify the field in the table that contains the Entity IDs; then you need to associate the fields in the database table to the corresponding fields in the event table.
- **No List** (default)—This option allows you to enter the values you want in the event table each time you add or edit an event. No list is created. When you use this option, the “Choose ID” dialog allows you to select from a list of values that exist in the event table you are editing.
- **Select Loaded**—Use this option to select an ID list you have already loaded into your project. You may have several ID lists loaded into your project, but you may only select IDs for indexing from one list at a time.

Changing Legend Symbolology

The RIT can update the legend for your event/waterbody and custom shape themes as you reach index. You can classify your legend by Entity_ID, Attr_prg, Attr_val, any combination of two of those fields, or all three fields.

To change the legend symbolology, select **Change Legend Symbolology** from the **NHD-RIT** menu. Check all of the values you would like to use for legend classification and click **OK** (Figure 29).



Figure 29. Fields to symbolize dialog

Selecting Reaches by Waterbody Name

Select Reaches by Waterbody Name is available from the **NHD-RIT** menu as well as the pop-up menu that is activated by right clicking on the View. This feature provides an easy method for you to select waters in NHD using waterbody name. When you choose **Select Reaches by Waterbody Name**, a dialog appears that allows you to select one or more names from the active NHDFlowline theme. You can also search for a name by typing the first few letters into the **Search Names for:** box. When you click **OK**, the NHD streams with the names you selected will be selected in your View. You can then use **Add Linear Event(s) or Entire Waterbody(ies)** to add them to your event/waterbody theme. It is a good idea to examine your selection before you add it to your event/waterbody theme.

Viewing/Updating Metadata

You can modify the current metadata information for an active event/waterbody or custom shape theme in your View by selecting **View/Update Metadata** from the **NHD-RIT** menu. You can view the current user information and source information. You can also delete any old metadata entries that no longer apply to the event table.

Viewing/Updating Users

You can change or modify the current user information for your project by selecting **View/Update Users** from the **NHD-RIT** menu. Changes you make to the user information will be reflected in the metadata for the event/waterbody and custom shape themes you are working with.

Converting to NHD Events

Convert to NHD Events allows you to convert existing GIS information containing surface water entities to NHD event tables. Any type of data that can be added to an ArcView View (Arc/Info coverage, shapefile, latitude/longitude coordinates) can be converted (conflated). You can convert all

three feature types (point, line, and waterbody) and coverages of multiple extents. For example, if you wish to convert a coverage that contains waters for a state basin that is comprised of three 8-digit USGS subbasins, as long as you load the appropriate NHDGEOinSHP workspaces into your View, events will be created for the entire state basin area. You can also conflate surface waters from multiple coverages to NHD event tables using this feature.

The RIT conflates the surface waters in your coverage to NHD events by generating a buffer area around each entity, selecting the NHD Flowlines that fall within the buffer and creating corresponding events. An example of a buffer area for a linear surface water is shown in Figure 30.

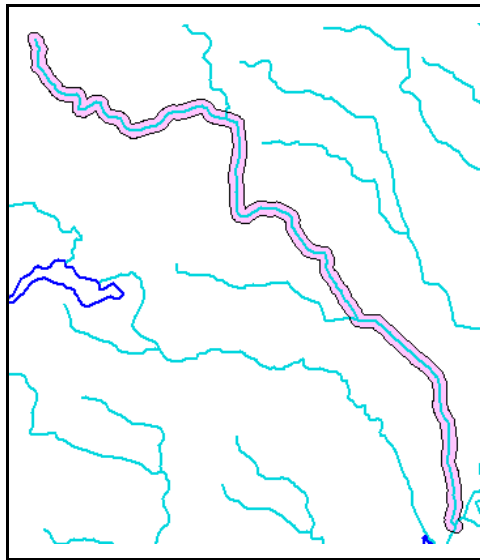


Figure 30. Example buffer area

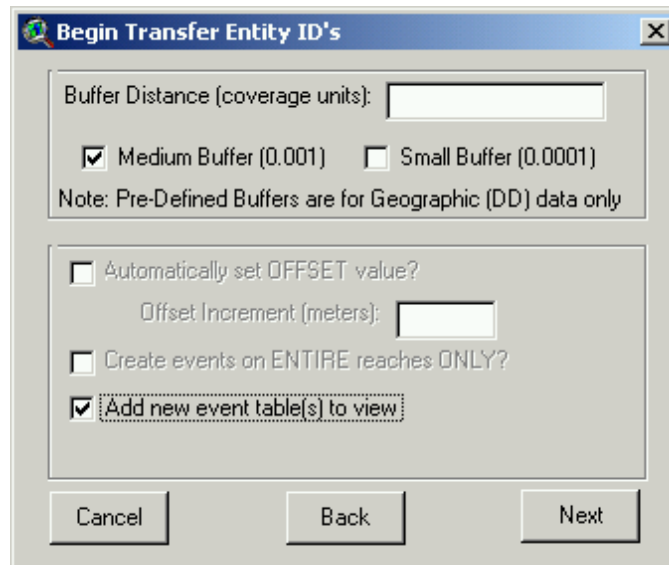
The RIT will prompt you to enter a buffer distance for the conversion. Increasing the buffer size will increase the number of NHD Flowlines that are selected for each entity in your coverage. This can decrease the accuracy of the conversion. Prior experience has shown that a buffer distance of 100 meters (equivalent to .001 when working in decimal degrees) works well for coverages with line work similar to NHD.

- Step 1.** Add the coverage(s) you want to convert to NHD events to your View. Use Load/Unload Workspace to add the appropriate NHDGEOinSHP workspaces.
- Step 2.** Choose *Convert to NHD Events* from the *NHD-RIT* menu. Select the theme(s) you want to convert to NHD events and click **Next**. (Remember, these themes can be linear, point, and polygon themes.)
- Step 3.** You are then prompted to select the NHDGEOinSHP workspaces you want to have events conflated to. Select the **NHDFlowline** themes for conflating points and linear events and the

NHDWaterbody Theme for migrating polygons. Select themes for all of the NHDGEOinSHP workspaces you would like to conflate events to. Click **Next**.

Step 4. Next you are prompted to select a buffer distance. You should enter the buffer distance in your coverage units (Geographic = decimal degrees, Albers = meters, etc).

The “Begin Transfer Entity IDs” dialog (Figure 31) has a check box that allows you to add the new event table(s) that are created during the migration to the View (this is a good idea if you wish to view the results right away). Check the appropriate options and click **Next**.

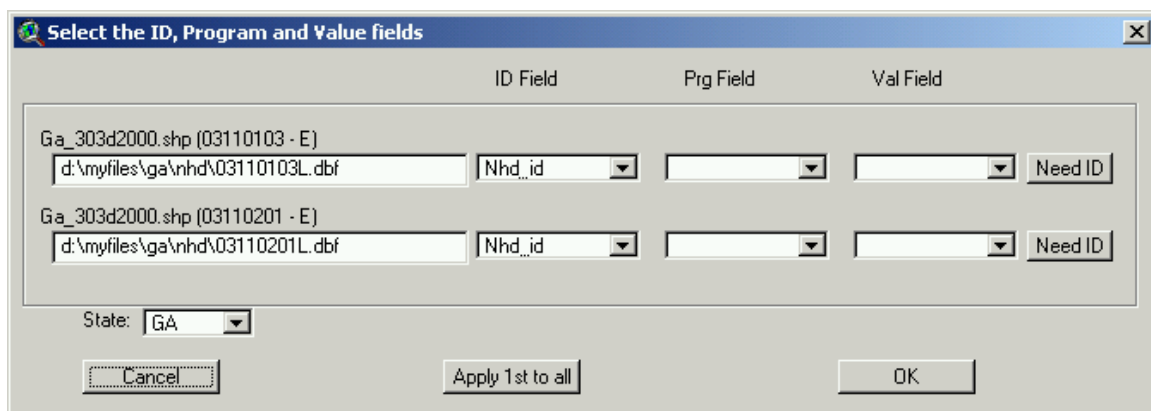


The dialog box titled "Begin Transfer Entity ID's" contains the following elements:

- A text input field for "Buffer Distance (coverage units):".
- Two radio buttons: ☒ "Medium Buffer (0.001)" and ☐ "Small Buffer (0.0001)".
- A note: "Note: Pre-Defined Buffers are for Geographic (DD) data only".
- A section with three options:
 - ☐ "Automatically set OFFSET value?" with a sub-field "Offset Increment (meters):".
 - ☐ "Create events on ENTIRE reaches ONLY?"
 - ☒ "Add new event table(s) to view:"
- Three buttons at the bottom: "Cancel", "Back", and "Next".

Figure 31. Begin transfer entity IDs dialog

Step 5. You are then prompted to specify which fields in your coverage attribute tables are equivalent to the Entity_ID, Attribute Program, or Attribute Value fields in the event table (Figure 32).



The dialog box titled "Select the ID, Program and Value fields" contains the following elements:

	ID Field	Prg Field	Val Field	
Ga_303d2000.shp (03110103 - E)	<input type="text" value="d:\myfiles\ga\nhd\03110103L.dbf"/>	<input type="text" value="Nhd_id"/>	<input type="text"/>	<input type="text" value="Need ID"/>
Ga_303d2000.shp (03110201 - E)	<input type="text" value="d:\myfiles\ga\nhd\03110201L.dbf"/>	<input type="text" value="Nhd_id"/>	<input type="text"/>	<input type="text" value="Need ID"/>

State:

Buttons:

Figure 32. Select ID, Program, and Value Fields dialog

Use the **Apply 1st to All** button to apply the values you select for the first theme to the remaining themes. You can change the name and storage location of the event table that will be created by modifying the path name in the text box. You must enter a path name that already exists (the migration will not create a directory for you). You can also choose the state your surface waters are located in and the State field will be populated in each event/waterbody table. Make your selections, then click on the **Need ID** button to enter metadata for each event table you are creating. Enter all of the required information, then click **OK** on the metadata entry form. Click **OK** on the “Select ID...” form.

When you convert multiple coverages to NHD event/waterbody tables, the RIT creates an event/waterbody theme for each input coverage and then merges them together to create one output theme for each feature type. This can result in the creation of overlapping event/waterbodies in the table. You can identify these overlaps in the linear event tables using the RIT’s **Find Overlaps** utility.

You should always carefully examine the output of Convert to NHD Events. After running the conversion, examine each entity to make sure it is correctly represented in NHD. You can use the RIT’s **QAQC Converted NHD Events** feature to help with this process.

Performing Quality Assurance/Quality Control (QA/QC) on Converted NHD Events

As you run Convert to NHD Events feature, the RIT creates a QA log that stores codes that indicate the success of your conversion. The QAQC Converted NHD Events feature aids in the process of comparing your coverage to the converted NHD event themes and shows you the values stored in the QA log. You can QA only one event/waterbody theme at a time.

- Step 1.** Select ***QAQC Converted NHD Events*** from the ***NHD-RIT*** menu.
- Step 2.** You will be prompted to navigate to the QA tables that were created during the conversion process. The QA table will be stored in the same directory as the new event table and will be named “EventTableName” + “_qa”. Select the appropriate file.
- Step 3.** The QA dialog will open (Figure 33). In the three drop-down boxes at the top of the dialog, you need to select the original coverage used in the conversion, the name of the event table you want to QA, and the name of the corresponding QA table. The original coverage and the new event theme must be loaded into your view in order for this to work. When you select the original coverage, you will be prompted to select the fields in the coverage that correspond to the Entity_ID, Attr_prg, and Attr_val fields in the event table. If you are not using the field you are being prompted for, click **Cancel**. If the QA table you need is not in the drop-down list, you can click on the **Add QA Table** button to add it to the project.

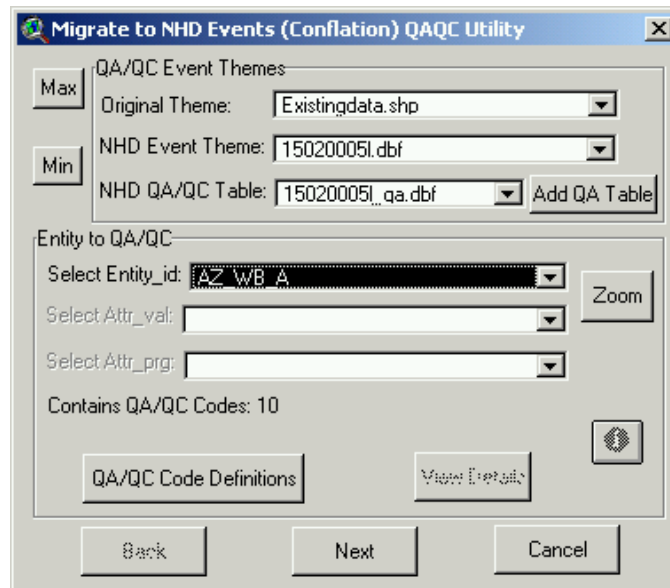


Figure 33. QA dialog box

Step 4. The **Select Entity_id** drop-down will contain the identifiers for all of the surface waters in your source coverage. Choose the first one from the list and click **Zoom**. The RIT will enlarge the View scale so that you can see the selected entity. If the QA dialog is in the way when you are viewing the selection, you can use the **Min** button to minimize its size in the View. The RIT classifies your legend as follows for QA:

Thin Red line – entity in the NHD event theme

Thick Gray line – entity in the source coverage

Bright Blue line – NHD streams.

Any place where the red and gray lines do not match is a place you may need to correct, either using the Event Editing Tool Box or by adding new events.

Step 5. You can use the **Next** and **Back** buttons to step through each entity in the source coverage. For each entity that you examine, the QA dialog will present the QA/QC codes from the QA table. These codes are an indication of how well the migration went, where 10 is a success and 1 indicates a problem. To view the QA/QC code definitions, click on the **QA/QC Code Definitions** button.

Converting to a Custom Shape Theme

The Convert to a Custom Shape Theme feature allows you to convert any shapefile or coverage into a format that is compatible with the RIT. This can be used for features that are not appropriate for georeferencing to NHD, such as shellfish harvesting areas. You can also use Custom Shapes to represent NHD waterbody polygons that do not have reach codes. The advantage of converting themes into this format is that you can then take advantage of all of the editing capability available through the RIT, such as creating shapes and using the ID list, while maintaining metadata that is FGDC- (Federal Geographic Data Committee-) compliant.

- Step 1.** Add to the view the theme you want to convert and make it active.
- Step 2.** Select *Convert to a Custom Shape Theme* from the *NHD-RIT* menu.
- Step 3.** You will then be prompted to select the fields in the theme attribute table that correspond to the fields in the event table (Figure 34). Select the field you want to use for Entity_ID. The other fields are optional. Once you have made your selections, click **OK**.

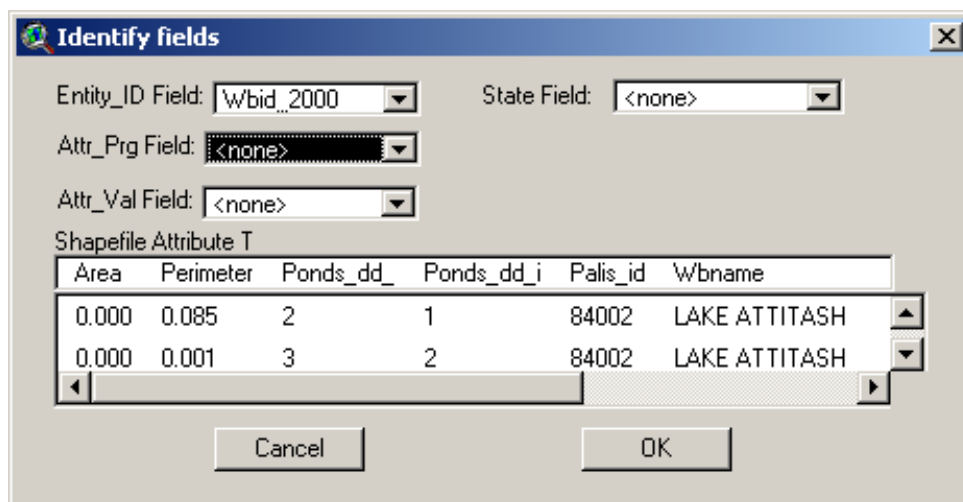


Figure 34. Identify fields dialog box

- Step 4.** You will be prompted for the name and storage location for your custom shape theme. You can enter any filename and directory you wish. Once you have made your selections, click **OK**.
- Step 5.** You will be prompted to enter metadata. Click **Create New** and fill out the metadata dialog. After you click **OK**, the RIT will create your custom shape theme and add it to the view.

The Convert to a Custom Shape Theme feature does not change the shapes that are in your original theme, so there is no QC feature for this tool.

Completing Event/Waterbody Indexing

Once you have used the RIT tools to do event/waterbody indexing you may want to use the Find Overlaps or State Border Snapping features. This section describes those features and provides guidance on managing the files created by the RIT.

Finding Overlaps

When you have finished editing a linear event table, it is a good practice to run the **Find Overlaps** feature. Find Overlaps will identify linear event segments that occupy the same spatial extent on an NHD Flowline and have the same offset.

- Step 1.** Make the linear event theme active and select **Find Overlaps** from the **NHD-RIT** menu. The RIT will notify you if your event table does not have any overlaps.
- Step 2.** If there are overlaps, the RIT will open the attribute table for the linear event theme, with the first set of overlapping event records selected. The RIT will also zoom to the selected overlapping events in your View. A small dialog box will show you the values for the selected records (Figure 35).

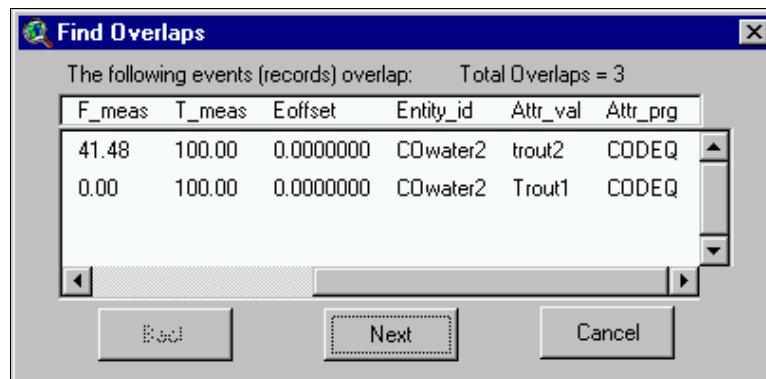


Figure 35. Find Overlaps dialog box

- Step 3.** You can resolve an overlapping entity situation several ways:
- If the values in the attribute fields (Entity_id, Attr_val, and Attr_prg) and the F_meas and T_meas fields are identical, then the overlapping event is a duplicate and can be deleted. If there is a difference in the F_meas and T_meas values for the overlapping events, you will want to decide which event is correct and delete the other one. To delete an overlapping event, select the event in the attribute table, open the View and click the **Delete Events/Waterbodies** button. It is a good idea to check the output in your View, to make sure the resulting entity delineation is what you intended.

- If the values in the attribute fields (Entity_id, Attr_val, and Attr_prg) are different, you can resolve the overlap by changing one of the offset values. To change the offset, select the record in the table you wish to modify, return to the View and click the **Edit Events/Waterbodies** button to change the offset. Visually inspect the results of your edit in the View to ensure the results are what you intended.

Step 4. After you have resolved the overlap, click on the **Next** button to view the next set of overlapping reaches. The RIT will notify you when all of the overlaps have been resolved.

State Border Snapping

You can use the State Border Snapping feature to make sure that your events and waterbodies are contained in the correct state and do not hang over into an adjoining state. This feature will also extend any NHD events and waterbodies that stop short of the state boundary to the state boundary (snapping). You set a snapping distance to determine when events should be snapped to the state line. If you do not want to snap events to the state line, set the buffer distance to 0. The State Border Snapping feature creates a log file that lists the event, waterbody, and custom shape themes that were processed, as well as any problems that were encountered during the procedure.

To use this feature, you must have a polygon shapefile for the state of interest with the two letter abbreviation for the state in one of the attribute fields. You can use this feature on linear and point event tables, waterbody tables, and custom shapes. (*Note that only clipping is performed on custom shapes; custom shapes cannot be snapped*). The State Border Snapping function performs somewhat different operations for each feature type.

- **Linear Events/Custom Lines**—Clips all line segments that extend into another state to the state line and deletes any segments that are entirely outside of the appropriate state polygon. Snaps linear events to the state line if the distance between the end point of the event and the intersection of the state line along the indexed reach is less than or equal to the snapping distance you set.
- **Point Events/Custom Points**—Does not modify the location of any point. Writes the location of any points that are located outside of the specified state to the log file so you can examine them.
- **Waterbodies/Custom Polygons**—Deletes all polygons that are located entirely outside of the state of interest. Clips polygons that are intersected by the state border. For NHD waterbodies, checks to see if snapping should occur by generating a buffer around the indexed waterbody using the snapping distance you, set and snaps if the state border intersects the buffer generated around the waterbody.

Step 1. Load the event/waterbody themes or custom shapes theme you wish to perform border snapping on into your View using the RIT's Load NHD Event Theme or Load Custom Shape theme feature as appropriate.

- Step 2.** Select *State Border Snapping* from the *NHD-RIT* menu. This will open the “state border snapping” dialog (Figure 36).

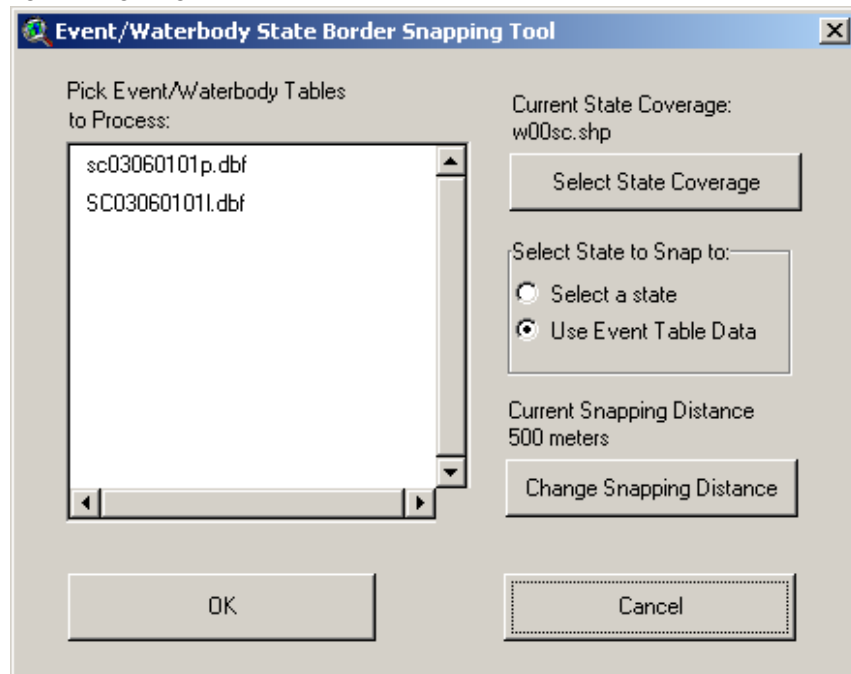


Figure 36. State Border Snapping dialog box

- Step 3.** Choose the event/waterbody and custom shapes tables you would like to process from the list on the left hand side of the dialog. Hold down the **Shift** key to select multiple tables.
- Step 4.** Click on the *Select State Coverage* button. You will be prompted to navigate to the shapefile containing the state polygons you would like to use (Figure 37).

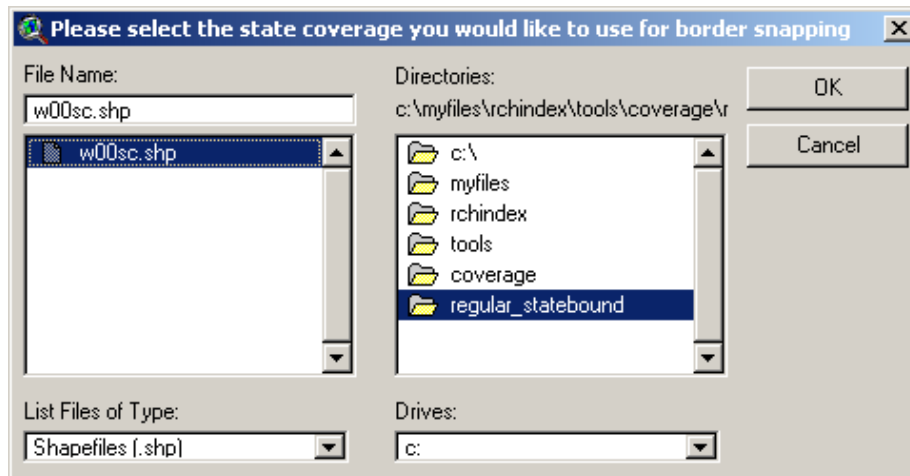


Figure 37. Select state polygon shapefile

Navigate to the shapefile and click **OK**.

- Step 5.** Next you will be prompted to select the field containing the two letter state abbreviations (for example, a field that would contain “SC” for South Carolina) (Figure 38).

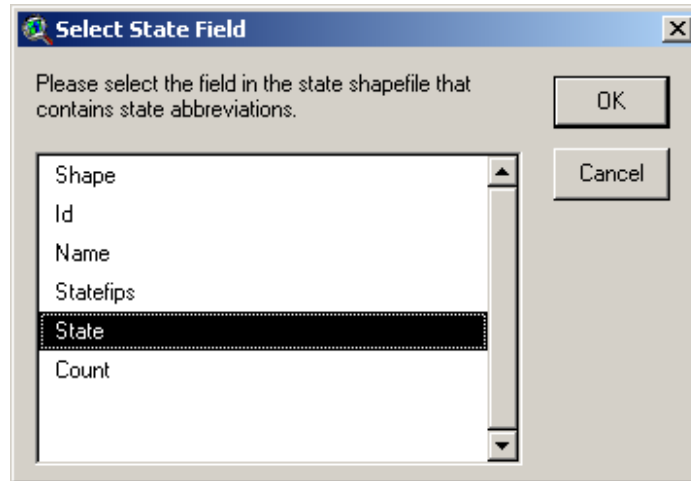


Figure 38. Select state field

Select the appropriate field and click **OK**.

- Step 6.** In the **Select State to Snap To** option box, you can choose to select a state for border snapping, or you can use the data in the event table. If the event table contains data for only a single state, you can choose the **Select a state** option and the table will be formatted for the state you select. If the event table contains data for multiple states, or you want to run a batch of event tables that are in more than one state, you can choose **Use Event Table Data**. This option will use the values in the State field of the event tables for processing.

Important: You can use the **Use Event Table Data** option only if the state field is populated in the event table for every record. Otherwise, the lack of state data will be noted in the log file and the event/waterbody table or custom shapefile will not be processed. Under **Select a State**, if you choose the wrong state, your event table(s) will be deleted. **Make sure you select the correct state if you use the Select a State option.**

- Step 7.** Click on the **Change Snapping Distance** button to define the tolerance for snapping linear events and NHD waterbodies that fall short of the state line to the border. A snapping distance of 100–500 meters is recommended. If you do not want to snap events, set the snapping distance to 0.

- Step 8.** Once all of the options are set, click **OK**. You will be prompted for the storage location of the log file. You should review the log file after the process is complete to check for any problems.

Managing the Output Files

Each time you create a new event, waterbody, or custom shape theme with the RIT, the following files are generated:

- **Event Table (e.g., 10190006L.dbf)**—This is the table that contains the reach indexing information (Reach codes, To and From measures, Entity_ID, Attr_val, Attr_prg etc).
- **Metadata Table (e.g., 10190006L_M.dbf)**—This table stores all of the metadata you entered, including the user information and source information. This table can be joined to the event table through the Meta_id field. This relationship allows the RIT to store record level metadata.

Note that when waterbody tables or custom shapes are created, .shp and .shx files are also created for the shapefile.

After you are satisfied with the content of your event, waterbody, or custom shape theme, you can use the Export Bundled Files utility to bundle the event, waterbody, or custom shape files with all of the associated metadata files into a single compressed unit. This format is useful for storing and maintaining your event tables. It is also the format your event tables must be in if you wish to submit them to EPA. Select **Export Bundled Files** from the **NHD_Tools** menu.

The “Bundle Export” dialog (Figure 39) allows you to export event, waterbody, and custom shape themes that are loaded in your project. Select the themes you would like to export and click **OK**. Use the shift key to select more than one RIT theme. The compressed files will be given the same name as the event, waterbody, or custom shape theme and will be stored in the same directory.

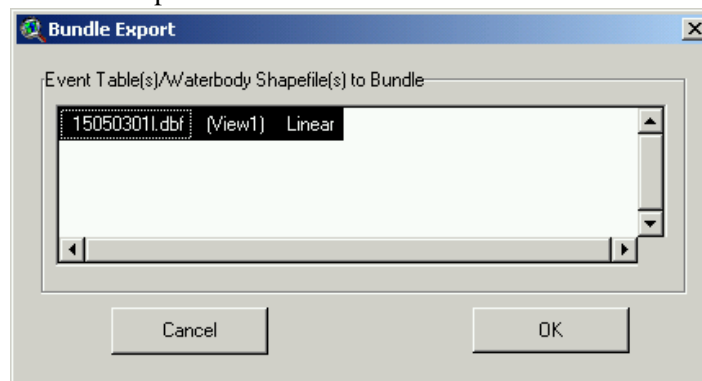


Figure 39. Bundle Export dialog box

NHDGEOinSHP Reach Indexing Tool

The following table lists the files contained in the bundled export files.

Table Type	Compressed File Contents
Linear or Point Event Table (eventTable.zip)	eventTable.dbf eventTable.shp* eventTable.shx* eventTable_M.dbf
Waterbody Table or Custom Shape (themeName.zip)	themeName.dbf themeName.shp themeName.shx (and any other shapefile components—.sbn, .sbx, .ain,.aih) themeName_M.dbf

You will only need to archive the .zip files. When you want to re-import these files for later use with the RIT, use the Import Bundled Files utility available under the ***NHD_tools*** menu.

The Export Bundled Files utility creates shapefiles for linear and point events. This is to facilitate the use of these event themes, but these shapefiles can also be used by the indexer for mapping and display. *Note that these shapefiles are only updated upon export. If you make updates to your linear or point event tables, you must export a bundled file, and then use the shapefile contained in that bundle to view your current work.*

Export Bundled Files also populates the size field to the event tables. These are for EPA's Reach Addressing Database (RAD). Linear event sizes are in meters and waterbody sizes are in square kilometers. Point events have no size. These sizes are only updated when you export bundled files, so if you make updates to these event tables and you want to use the sizes, you must export bundled files and then use the event tables in the bundles in order to have current size information.

When you use the Import or Export Bundled Files utility, the RIT opens a DOS window. If this DOS window does not close when the operation is complete, right click on the dialog menu, check the "Close on Exit" box and click **Apply**.

Note: Export Bundled Files copies your event tables and associated files to the default "Temp" directory on your computer. It is a good idea to periodically delete these files from your temp directory. On Windows 95/98 machines this is typically "c:\Windows\Temp" and on Windows NT it is "c:\Temp". On Windows XP machines the location is C:\Documents and Settings\Local Settings\Temp.

NHDGEOinSHP Navigate

The **Navigate** extension allows users to perform navigation on all NHDGEOinSHP workspaces loaded into the current view and display the navigation results. NHDGEOinSHP workspaces should be loaded into the current view using the Load/Unload extension that is also a part of the NHDGEOinSHP ArcView Toolkit. In order to perform navigations, you need to include the NHD Flowline theme when you load the NHDGEOinSHP workspace using Load/Unload NHDGEOSHP Workspace.

Using Navigate

- Step 1.** To use **Navigate**, choose *Extensions...* from the **File** menu in your ArcView project, check the check boxes for **NHDGEOSHP Load/Unload Workspace** and **NHDGEOSHP Navigate**. Open a new View.
- Step 2.** Choose *Load NHDGEOSHP Workspace* from the **NHD_Tools** menu to load an NHDGEOinSHP workspace into your View. Make sure your load includes the **NHDFlowline** theme
- Step 3.** Make the **NHDFlowline** active, click on the one of the Navigate tool choices (rightmost tool button with blue arrow), then, in the View, click on the location on the NHDFlowline theme where you would like to start your navigation.
- Step 4.** The Navigation will highlight the resulting drains in your View.

Types of Navigation

When you load the **NHDGEOSHP Navigate** extension into your project, you get a drop-down button tool that allows you to select the type of navigation you would like to perform. To use Navigate simply click on the desired tool, then click on the NHDFlowline theme where you would like to start the navigation.



Upstream Mainstem

Selects all mainstem NHDFlowlines upstream from the selected NHDFlowline.



Upstream Mainstem with tributaries

Selects all mainstem and tributary NHDFlowlines upstream from the selected NHDFlowline.



Downstream Mainstem

Selects all mainstem NHDFlowlines downstream from the selected NHDFlowline.



Downstream Mainstem with divergences

Selects all mainstem NHDFlowlines and divergences downstream from the selected NHDFlowline.



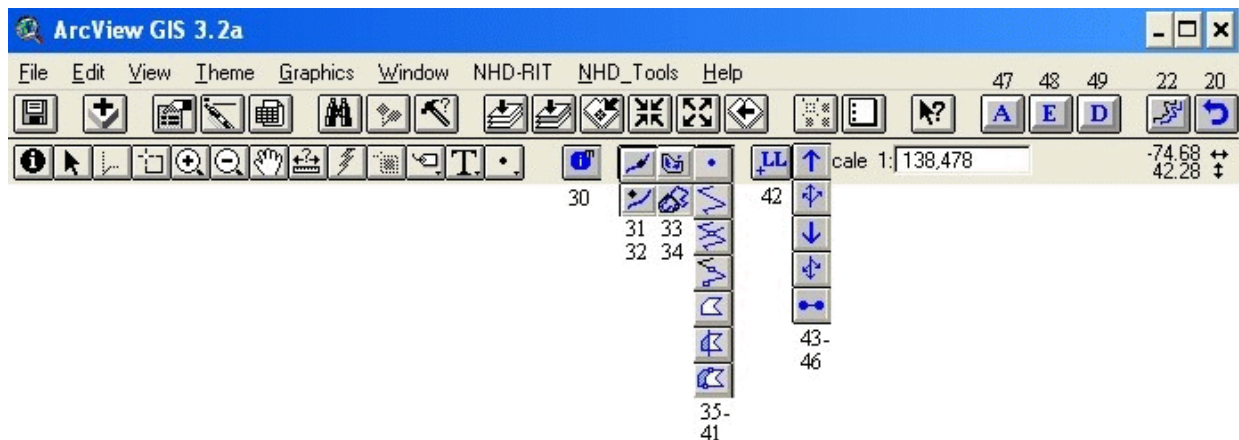
Point to Point

Selects all NHDFlowlines along the flow path between the two selected points.

NHDGEOinSHP Toolkit Function Reference

The functions shown below may be available depending on which NHDGEOinSHP Toolkit extensions have been loaded into your project. This section contains a brief description of each function by reference number, including which Toolkit extension the feature is part of.

NHD_Tools		NHD-RIT	
1	Project NHDGEOinSHP Workspace	13	Load NHD Event Theme
2	Load NHDGEOinSHP Workspace	14	Load Custom Shape Theme
3	Unload NHDGEOinSHP Workspace(s)	15	View/Update Metadata
4	Show NHDGEOinSHP Tables	16	View/Update Users
5	Hide NHDGEOinSHP Tables	17	Change ID List
6	Change View Name	18	Change Legend Symbology
7	Refresh Loaded Workspace(s)	19	Change Snapping Distance
8	Navigation Options	20	Undo Delete
9	Clear Navigation Start	21	Copy Events
10	Import Bundled Files	22	Draw Offsets
11	Export Bundled Files	23	Find Overlaps
12	Uncompress NHD Workspace	24	Merge Events
		25	Select Reaches by Waterbody Name
		26	Convert to NHD Events
		27	QA/QC Converted NHD Events
		28	Convert to a Custom Shape Theme
		29	State Border Snapping



- 1 Project NHDGEOSHP Workspace (*NHDGEOSHP Projection Utility extension*)** - Allows you to project an NHDGEOinSHP workspace to the current view projection or National Albers.
- 2 Load NHDGEOSHP Workspace (*NHDGEOSHP Load/Unload Workspace extension*)** - Allows the user to load an NHDGEOinSHP workspace into the current View. You can load all themes, tables, and links, define a custom collection of NHD features to load, or load reach indexing themes, tables and links.
- 3 Unload NHDGEOSHP Workspace(s) (*NHDGEOSHP Load/Unload Workspace extension*)** - Allows you to remove from your View NHDGEOinSHP workspaces that you have added using Load NHDGEOSHP Workspace. **Unload NHDGEOSHP Workspace(s)** will also remove any event/waterbody tables in the project that have been associated with the workspace using the RIT.
- 4 Show NHDGEOSHP Tables (*NHDGEOSHP Load/Unload Workspace extension*)** - Tiles your ArcView windows so that you can view any NHD tables you have loaded into your project. When you make a selection in the View or any of the tables, records in any linked tables will also be selected.
- 5 Hide NHDGEOSHP Tables (*NHDGEOSHP Load/Unload Workspace extension*)** - Closes the NHD table windows in ArcView.
- 6 Change View Name (*NHDGEOSHP Load/Unload Workspace extension*)** - You should use **Change View Name** to change the name of a View in which you have used Load NHDGEOSHP Workspace to add NHD themes. If you use conventional ArcView methods to rename a View, the Load/Unload Workspace extension will malfunction.
- 7 Refresh Loaded Workspace(s) (*NHDGEOSHP Load/Unload Workspace extension*)** - Load/Unload Workspace creates files in your temp directory that store information about the linkages ArcView puts in place when you load a workspace. If these temp files are deleted, ArcView will prompt you for their location when you open a saved ArcView project where you used Load/Unload NHDGEOSHP Workspace. **Refresh Loaded Workspace(s)** will recreate these files for you so that you may continue to use your project. This feature is also useful for restoring a workspace in your View when a theme, table, or link is inadvertently renamed or deleted from the project.
- 8 Navigation Options (*NHDGEOSHP Navigate extension*)** - This feature allows you to enter parameters for the navigations you perform using **NHDGEOSHP Navigate**. You can specify whether you would like your navigations to begin with whole NHDFlowlines or at a specified point along a Flowline. You can also specify a maximum distance for the navigation.
- 9 Clear Navigation Start (*NHDGEOSHP Navigate extension*)** - This feature can be used to clear the starting point of a “Point to Point” navigation.

- 10 Import Bundled Files (*NHDGEOSHP Reach Indexing Tool extension*)** - Event/waterbody tables are often stored zipped files that also contain the associated metadata. You can use **Import Bundled Files** to import these bundles so you can use the event/waterbody tables with the RIT.
- 11 Export Bundled Files (*NHDGEOSHP Reach Indexing Tool extension*)** - Creates zipped files for the NHD event/waterbody themes in your View. This feature creates a single archive containing the event table and metadata table for each event/waterbody theme. **Export Bundled Files** also creates shapefiles for linear and point events and adds a size field to linear and waterbody themes. The shapefiles and sizes are only updated on export. In order to submit your event tables to EPA for inclusion in the Reach Addressing Database (RAD), your event tables must be in this bundled format.
- 12 Uncompress NHD Workspace (*NHDGEOSHP Reach Indexing Tool extension*)** - Can be used to decompress NHDGEOinSHP workspaces downloaded from the NHD Web site (<http://nhd.usgs.gov>). **Uncompress NHD Workspace** is very useful for batch decompression of NHDGEOinSHP workspaces.
- 13 Load NHD Event Theme (*NHDGEOSHP Reach Indexing Tool extension*)** - Allows you to add an NHD event/waterbody theme to your project. In order to load an event/waterbody theme, you must first load the NHDFlowline and the NHDWaterbody themes for the corresponding NHD workspace using Load/Unload NHDGEOinSHP workspace. You can also use this feature to make an event/waterbody table active for editing with the RIT using the **Select a loaded event/waterbody table** option.
- 14 Load Custom Shape Theme (*NHDGEOSHP Reach Indexing Tool extension*)** - Allows you to add an RIT Custom Shape theme to your project. You can also use this feature to make the custom shapes theme active for editing with the RIT using the **Select a Loaded Custom Theme** option. This affects which custom theme new shapes are added to.
- 15 View/Update Metadata (*NHDGEOSHP Reach Indexing Tool extension*)** - Allows you to update the current metadata for an active event/waterbody table. You can either select a metadata entry that has already been created for the table, make an update to an existing entry, or create a new entry. The metadata entry you select will be associated with each record in the event/waterbody table that you create/modify during your indexing session.
- 16 View/Update Users (*NHDGEOSHP Reach Indexing Tool extension*)** - Allows you to change the current user for the indexing session or update the contact information associated with a user. This information is stored in the metadata record associated with the current reach indexing session.
- 17 Change ID List (*NHDGEOSHP Reach Indexing Tool extension*)** - An ID list can be used with the RIT to provide you with a list of identifiers for selection instead of requiring you to type in identifiers. This saves time and reduces the risk of typographic errors that will prevent an associated database from joining with the GIS work. **Change ID List** allows you to select your desired ID List option. You can change your ID list method or your ID list at any time during

your reach indexing session. The default is “No List,” which allows you to choose from the list of values that are already in the current event table.

- 18 Change Legend Symbology (NHDGEOSHP Reach Indexing Tool extension)** - Classifies your event, waterbody, or custom shape theme legend by Entity_ID, Attribute Program, or Attribute Value; any combination of two of those fields; or all three fields. You can use the Use as Default Symbology check box to apply your selection to all of the event, waterbody, and custom shape themes in your project.
- 19 Change Snapping Distance (NHDGEOSHP Reach Indexing Tool extension)** - By default, the RIT uses a 0 percent snapping distance. Increasing the snapping distance percentage will increase the distance which a linear endpoint edit or added point event will snap to the NHDFlowline endpoint from. If the snapping distance is set to 10 percent, a linear event end point edit or added point event within 10 percent of the length of the underlying NHDFlowline’s end point, will snap to that drain’s end point. You can use **Change Snapping Distance** to change this snapping percentage. The snapping distance you select will affect the Move End Point and Add Point Event on drain features.
- 20 Undo Delete (NHDGEOSHP Reach Indexing Tool extension)** - You can use **Undo Delete** to restore events/waterbodies that you have deleted using the RIT’s Delete Events/Waterbodies feature. It will restore the events/waterbodies from your most recent delete.
- 21 Copy Events (NHDGEOSHP Reach Indexing Tool extension)** - Allows you to copy existing linear events and display them offset from the original event. You define the appropriate offset value in your View projection units. The table below suggests some offsets for different View projections. Modify these values as necessary to display your offsets at the desired View scale.

View Projection Units	First Offset	Second Offset	Third Offset
Decimal Degrees	.001	.002	.003
Meters	100	200	300
Feet	300	600	900

Note: The offset value stored in your event table (offset field) is stored in coverage units, but you enter the offset value in View units. If your View is not projected, then coverage units = View units.

- 22 Draw Offsets (NHDGEOSHP Reach Indexing Tool extension)** - Offset events do not always display due to a known ArcView bug. The **Draw Offsets** button will select the offset reaches and force them to draw. Use ArcView’s Clear Selected Features button to clear the selection (your offset reaches will remain visible in the View until you pan or change the view scale).
- 23 Find Overlaps (NHDGEOSHP Reach Indexing Tool extension)** - Identifies linear event segments that occupy the same spatial extent on an NHDFlowline and that have the same offset value. For more information on using **Find Overlaps**, see Completing Event/Waterbody Indexing in the RIT section of this document.

- 24 Merge Events (*NHDGEOSHP Reach Indexing Tool extension*)** - Allows you to merge contiguous linear or waterbody events that are located on the same reach. This is useful for restoring events that you have split using Split One Event into Two from the Event Editing Tool Box. The events/waterbodies must have the same Entity ID, Attribute Program, and Attribute Value in order to be merged.
- 25 Select Reaches by Waterbody Name (*NHDGEOSHP Reach Indexing Tool extension*)** - Allows you to query the active NHDFlowline or NHDWaterbody Themes by presenting a list of all reach names available in the workspace. You can select one or more names for selection, and can also search for names using the “Search Names for:” text box.
- 26 Convert to NHD Events (*NHDGEOSHP Reach Indexing Tool extension*)** - Allows you to convert an existing coverage of surface water entities to NHD event/waterbody tables. You can convert points, lines, and waterbody polygon coverages. To run a conversion you need to add the existing coverage to your View and load all of the corresponding NHDGEOinSHP workspaces that you would like to create event/waterbody tables for. You can set up a batch migration for multiple workspaces. It is strongly recommended that you carefully examine the output event/waterbody tables. The RIT’s QAQC Converted Events feature is designed to help you with this process.
- 27 QAQC Converted NHD Events (*NHDGEOSHP Reach Indexing Tool extension*)** - Steps you through each surface water entity in your original coverage for comparison against the event/waterbody table created with Convert to NHD Events.
- 28 Convert to a Custom Shape Theme (*NHDGEOSHP Reach Indexing Tool extension*)** - Allows you to convert an existing coverage to a format that can be edited with the RIT. This can be used for features that can not be georeferenced to NHD, such as shellfish harvesting areas or groundwater protection areas. It can also be used to represent NHD Waterbody polygons that do not have reach codes.
- 29 State Border Snapping (*NHDGEOSHP Reach Indexing Tool extension*)** - Can be used to make sure all of the themes you have created with the RIT are contained in the appropriate state. Any entities that extend outside of the state will be clipped to the state boundary. You can also choose to snap NHD events and waterbodies to the state border within a user-specified tolerance. If you want to use this tool on data that contain information for multiple states, select the Use Event Table Data under the Select State to Snap to: options on the **State Border Snapping** dialog.
- 30 Display Measure (*NHDGEOSHP Load/Unload Workspace extension*)** - Returns the reachcode and measure information for reaches of loaded NHDFlowline themes.
- 31 Add Point Event on Reach (*NHDGEOSHP Reach Indexing Tool extension*)** - Allows you to create a point event along an NHDFlowline. This point is georeferenced to NHD using the reach measure value where the point is located (P_meas).

- 32 Add Offset Point (*NHDGEOSHP Reach Indexing Tool extension*)** - Available as a tool drop-down under the **Add Point Event on Reach** tool button. **Add Offset Point** allows you to create a point event that is not located directly on an NHDFlowline. Offset points are georeferenced to NHD using a reach measure value of a nearby reach and an offset value to display them at the desired location.
- 33 Add Entire Waterbody(ies) (*NHDGEOSHP Reach Indexing Tool extension*)** - Allows you to reach index the waterbody polygons in the NHD Waterbody theme.
- 34 Add Partial Waterbody (*NHDGEOSHP Reach Indexing Tool extension*)** - Available as a tool drop-down under the **Add Entire Waterbody(ies)** tool button. **Add Partial Waterbody(ies)** allows you to reach index a portion of a polygon in the NHD Waterbody theme.
- 35–41 Custom Shape Tools (*NHDGEOSHP Reach Indexing Tool extension*)** - These tools allow you to create and modify custom shape features.



Add Custom Point

Allows you to create a custom point.



Add Custom Line

Allows you to create a custom line.



Split Custom Line

Allows you to split one custom line into two.



Merge Custom Line

Allows you to merge custom lines that have the same Entity_ID, Attribute Program, and Attribute Value into a single feature.



Add Custom Polygon

Allows you to create a custom line.



Split Custom Polygon

Allows you to split one custom polygon into two.



Append Custom Polygon

Allows you to merge custom polygons that have the same Entity_ID, Attribute Program, and Attribute Value into a single feature.

- 42 LatLong (*NHDGEOSHP Reach Indexing Tool extension*)** - The **LatLong** button will return the latitude and longitude for any point in the active View. To use this tool, click on the desired location in the View, and a dialog box will tell you the latitude and longitude coordinates.
- 43-46 Navigation Tools (*NHDGEOSHP Navigate extension*)** - Several navigation tools are available from this tool dropdown.



Upstream Mainstem

Selects all mainstem flowlines upstream from the selected flowline.



Upstream Mainstem with tributaries

Selects all mainstem and tributary flowlines upstream from the selected flowline.



Downstream Mainstem

Selects all mainstem flowlines downstream from the selected flowline.



Downstream Mainstem with divergences

Selects all mainstem flowlines and divergences downstream from the selected flowline.



Point to Point

Selects all flowlines along the flow path between two selected points.

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- 47 Add Linear Event(s) or Partial Waterbody(ies) (*NHDGEOSHP Reach Indexing Tool extension*)** - Adds selected NHDFlowline segments or NHD Waterbody polygons to an associated linear event or waterbody table. If there is no corresponding event/waterbody table for the selected reaches, the RIT will prompt you to create a new table, or load an existing table. You can also use this feature to add selected shapes from another theme to a custom shapes theme.
- 48 Edit Events/Waterbodies (*NHDGEOSHP Reach Indexing Tool extension*)** - Opens the Event Editing Tool Box. This tool box allows you to modify the attribute values (Entity ID, Attribute Program, Attribute Value, and Offset) for the selected events, waterbodies, or custom shapes. You can also modify the spatial extent of a selected event using Move Endpoints or Split One Event into Two Events.
- 49 Delete Events/Waterbodies (*NHDGEOSHP Reach Indexing Tool extension*)** - Deletes the selected events, waterbodies, or custom shapes from the event/waterbody table. You should always delete entities from your event, waterbody, and custom shapes themes using the **Delete Events** button in the RIT. If you delete records from the attribute tables using conventional ArcView methods, the associated metadata files will be out of sync with the RIT theme.

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Troubleshooting

This section lists some common problems and solutions to them.

When I use Import Bundled Files, Export Bundled Files or Uncompress NHD Workspace, the DOS window does not close.

When the DOS window opens, right click on the title bar and select **Properties**. Make sure the box that says “Close on exit” is checked. You should only have to do this once on your computer (after which it should remain set).

When I try to Add a new feature, the RIT prompts me about creating a new event table.

When this happens, either the RIT is unsure which event theme you are trying to edit, or there is not a theme in the View for the feature type you are trying to add. If you are working with a theme that exists in your View, choose **Select a Loaded Event/Waterbody Table** and select it from the list box in the dialog. If you need to create a new event theme for the feature type you are adding, click **Create New Event/Waterbody Table**. See the Editing Event/Waterbody Themes in the RIT section of this User’s Guide for more information about which themes you can edit.

The Entity_ID, Attr_val, or Attr_prg value I want to use in my event table is not available in the Choose ID dialog.

Type the desired values into the text boxes for each field and click **OK**. Depending on the ID List method you are using, the RIT may prompt you to see if you want the new value to be added to your ID list table.

My Offset Events do not display.

Due to a known problem with ArcView, offset events do not always display in the View. Use the **Draw Offsets** button, then click **Clear Selected** to force them to draw. You will have the best results if you work in a View projection that is the same as your data projection (e.g., if your data are geographic, work in an unprojected View).

How do I know which NHDGEOinSHP coverage my event/waterbody table is associated with?

In order for your event table to display, you must have an associated NHDGEOinSHP coverage that has a reach segment with a reachcode for each rch_code listed in the event table. (You also need this NHDGEOinSHP coverage to edit a waterbody table with the RIT.) The default naming convention for event/waterbody tables created with the RIT is <NHDGEOcoverage>X.dbf where X is the first letter of the feature type (point, linear, or waterbody). If the default name was used, your event table should be associated with the coverage that is part of its name. If you have event tables that have been named another way, you may be able to narrow down the list of NHDGEOinSHP coverages they could be associated with by examining the rch_code in the event/waterbody table. The first 8 characters of rch_code identify the 8-digit USGS subbasin the reach is in.

Troubleshooting

The RIT caused ArcView to crash.

The RIT has been known to fail after intense indexing. The frequency of this problem is largely dependant on the number of event/waterbody tables in your project and the specifications of your computer. The more memory and available resources your computer has and the fewer event/waterbody tables in your project, the fewer problems you will encounter.

When ArcView is going to crash, you will see a message such as “spatial index cannot be created for... check available memory” or “too many files open.” You may also get a message suggesting that ArcView will try to recover. As soon as you get one of these messages, save your project and close ArcView. You can then reopen ArcView, and your project should function properly.

If you are unable to save your project before ArcView crashes, no work will be lost. Your event/waterbody table is saved each time you make an addition or edit. Simply re-add the event themes you were working with to a new RIT project and continue working.

My event table will not display correctly.

Sometimes event tables do not display correctly in the ArcView view. This will often occur after using the RIT's Delete Event/Waterbody function. Currently the only way to get the event table to display properly is to close ArcView, create a new RIT project, and re-add the event table to it.

Can I rename my event/waterbody tables?

Renaming event/waterbody tables is not recommended because the metadata files store information about the original event/waterbody table names.

The tool button I want to use is grayed out.

As you work with the RIT, only the tool buttons that can operate on the current active theme are available for use. If the tool you want to use is grayed out, you probably need to make a different theme active.

When I try to make a selection in the View, nothing happens.

This is usually due to one of two things. The first is that the theme you wish to make the selection on is not currently active. Make sure the theme is currently active in the View. The other possible problem is that as you create linear events and waterbodies, they display on top of the NHDFlowline and NHD Waterbody themes, so you can no longer see your selections in the underlying NHD themes. To view your current selections, simply turn off the linear and waterbody event themes.

My event will not split at the location I selected.

You will have the most success using the Split One Event into Two Events tool if you zoom in to the reach you want to split. This increases the accuracy of the split location you select with the mouse pointer.

My Offset Point Event is not at the location I selected.

Offset Points are linked to the nearest NHD stream with a calculated offset value. Offset points display perpendicular to the NHDFlowline they are linked to. Sometimes the location you select is not perpendicular to the nearest flowline, so the point that is added does not display at the desired location. You may be able to get better placement of your point by visually looking for a stream that would be

Troubleshooting

perpendicular with a line to your desired point, adding the point on the stream and setting the offset value manually (through the “Choose ID” dialog). You can use ArcView’s measure tool to help you select an appropriate offset value.

When I add my event/waterbody table to the View I get a message that says “Unable to Save Edits, please use the Save Edits as option.”

You must have write access to your waterbody/event table and the associated metadata and transaction files to edit them. You cannot edit event/waterbody tables that are on a CD-ROM or a network where you do not have write access. To use the event/waterbody tables, download them to your local workspace and use Windows Explorer to remove the Read Only property from the files.

When I try to add an event/waterbody to my event/waterbody theme I get an error message that says “Attempt to edit read-only virtual table (vtab).”

You must have write access to your waterbody/event table and the associated metadata and transaction files. You cannot add events/waterbodies to event/waterbody tables that are on a CD-ROM or a network where you do not have write access. To use the event/waterbody tables, download them to your local workspace and use Windows Explorer to remove the Read Only property from the files.

When I try to add a new ID or modify my ID list I get an error message that says “Attempt to edit read-only virtual table (vtab).”

You must have write access to your ID list order to add records to it or modify it.

When I use Move End Point, I get a message that says “No measure found.”

Zoom in to the end point you are trying to move and try again.

The RIT buttons are distorted in my View.

Maximize your ArcView window and your View windows and the buttons should display properly.

When I click on “Split one event into two” I get an error message that says “You can only have one event selected to split.”

If you get this message, you have more than one event in your event table selected. If it appears that there is only one selected, you may have overlapping reaches. Clear your selection and select the event reach you wish to split. If you still get the error message, open up the attribute table for your linear event theme, promote the selected records to the top of the table, and either delete one of the overlapping events, or set an offset value.

NHDGEOinSHP Toolkit Terms

Copied Events—In some cases, surface water entities may have overlapping extents. Dynamic segmentation allows for multiple entities to be referenced to the same NHDFlowline but displayed offset from one another, using an offset value entered by the user.

Dynamic Segmentation—Provides a means of linking and displaying surface water attribute data to NHD without requiring the modification of the underlying coordinate data. This surface water data can be linked to any portion of an NHDFlowline (independent of arc-node topology). It is dynamic segmentation that allows the RIT to create and display event tables that define waterbodies.

Entities—Groups of events in an event table that represent a homogeneous surface water unit. Information about these entities may be stored in an associated database and accessed using a unique identifier stored in the “Entity_id” field, or they may have homogeneous attributes stored in the event table itself. A waterbody is an example of an entity.

Event table—the main output of the RIT. These .dbf files can be displayed as themes in ArcView using the NHDFlowline. Event tables are linked to NHD through the unique NHD reachcode and can be displayed using ERSI’s Dynamic Segmentation model.

Event—a single record in an event table. This record is referenced to one NHD reach through the NHD reachcode. An event may represent an entire NHD reach or only a portion of one.

Flowlines—Flowlines are linear segments in NHD that compose reaches. One reach may consist of more than one flowline. The flowline is now the NHD layer that is used for linear georeferencing.

Measures—To and From measure fields in the event table define where along a reach the event is displayed. In the case of point events, only a single measure (Position measure) is stored to define its location on a reach.

Offset—the distance a copy of an event is displayed from the associated NHDFlowline.

Reach—a linear reach is a single NHD segment that typically is defined by tributary confluences.

Waterbody—a set of one or more hydrologic features (reaches) that are grouped together for organizational purposes. For example, a 305(b) waterbody may be a small watershed that is assessed for water quality. A waterbody can be composed of several NHD reaches, and their locations are stored in event tables as collections of events. Waterbodies are a type of entity. (*Note: ‘Waterbody’ is also the term used for areal reaches in NHD*).

Waterbody polygons—composed of areal NHD features (e.g., lakes, ponds). Some waterbody polygons have unique identifiers (reachcode) and some do not. Waterbody reaches are not part of the NHDFlowline network.